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SOME PHYSIOLOGICAL AND CLINICAL EFFECTS OF HIGH FAT FEEDING*

BY HAROLD L. HIGGINS, M.D.†

I WANT to discuss, this afternoon, some clinical and scientific observations we have made while working on diets relatively high in fats and relatively low in carbohydrates.

As the amount of fat in the diet of a normal person is increased and the amount of carbohydrate is simultaneously decreased, a point is reached where some of the fat is incompletely burned to carbon-dioxide and water, and in part becomes acetone, diacetic acid, and beta-oxybutyric acid. Roughly, this period begins when the number of grams of fat in the diet exceeds the number of grams of protein and carbohydrate combined. Carbohydrate may be said to be necessary for the complete combustion of fat in the body.

We know from experience with diabetic patients, especially in the pre-insulin days, that the occurrence of acetone bodies in the urine is not necessarily a cause for alarm. Ordinarily, these products are excreted as fast as they are formed. No fear of acidosis or coma need arise so long as the acetone bodies are excreted. Acidosis of an extreme degree, or coma, occurs ordinarily only when the means of excretion of the acid products are interfered with. The diabetic goes into coma when he gets an infection, and an infection that interferes with kidney function. A cloudy swelling of the kidney cells or infection of the kidney itself, especially of an arteriosclerotic kidney, might bring about sufficient damage to the acid-secreting power of the kidney to lead to the damming back of the acid bodies, to acidosis, and often to coma. Let me emphasize, "Damage to the kidney function for excreting acid is necessary for severe acidosis." Certain cerebral damage may also lead to acidosis, but that is not of the acetone body type. This aspect of acidosis is mentioned at this time because of the fear that the occurrence of acetone in the urine sets up in the minds of some practitioners.

Acetone bodies are formed when a person fasts, because the body is then katabolizing mainly fat. Certain of the physiological changes that occur in fasting also occur on high-fat low-carbohydrate diet.

About 1917 the attention of the medical world was drawn to the finding that the attacks in many cases of epilepsy were stopped, or lessened in severity and frequency, by starvation. The results in many cases were phenomenal, but when food was again started, the attacks recurred. Fasting could not go on forever. So several clinicians tried the high-fat low-carbohydrate (ketogenic) diets in epilepsy. Doctors Helmholtz, Peterman, and Talbot have done much work in this field. We have been quite successful in this method of treating epilepsy in Boston. A summary of the results of forty-one cases of epilepsy treated in our out-patient clinic at the Massachusetts General Hospital in Boston during the past year is given in Table I.

TABLE I

SUMMARY OF RESULTS WITH KETOGENIC DIET IN EPILEPSY

Group	Total Cases	Petit Mal only	Average age
I	11 (27%)	5 cases	7 years
II	17 (41%)	7 "	11½ "
III	13 (32%)	2 "	12 "
	41 (100%)		

Group I. Completely relieved.
Group II. Fewer and lighter attacks.
Group III. No definite improvement.

The statistics indicate that the diet cures only about one-quarter of the cases. The younger patients with only petit mal attacks have a better chance for relief by diet. Helmholtz brings out the fact that it is the idiopathic epilepsy,—the epilepsy for which no definite etiological cause is found,—which seems to respond to the treatment of ketogenic diet. However, many patients with other kinds of epilepsy from a known cause, such as *lues* or skull fracture, do seem to show improvement. The following case was one where there has been brilliant result. The chart here shows the findings.

CASE REPORT

This patient was 7 years old when she came under our care in October 1927. The child had been seemingly normal until she was 3 years of age. Then she had an attack of grand mal. Since 4½ years of age she had had frequent attacks of petit mal; from 5-40 attacks daily had been observed. Various methods of treatment had been tried, including chiroprac-

*Read before the Pennsylvania State Medical Society, October 3, 1928.

†Higgins—Assistant Professor of Pediatrics, Harvard Medical School. For record and address of author see "This Week's Issue", page 182.

tic manipulations and raw diet; the parents had become practically impoverished in paying for the treatment of their daughter with the expectation of her recovery.

She was admitted to the hospital, and put gradually upon a ketogenic diet. The change in diet was gradual in order that she might not have a gastric upset. The course of treatment in the hospital is outlined in Table II.

TABLE II

Date	Oct. 6	Oct. 7-11	Oct. 12-16	Oct. 17-21	Oct. 22-26	Oct. 27-Nov. 3	(a) Nov. 4-12	Nov. 13-16
Weight (kilograms)	31.4	30.9	30.3	29.9	29.8	29.4	29.3	29.1
Diet								
Protein (grams)		32	32	32	32	32	32	32
Fat "		129	146	151	156	158	158	174
Carbohydrate "		54	41	28	20	13	13	26
Fat: Cbdte. plus Prot. (b)	1:3	1.5:1	2:1	2.5:1	3:1	3.5:1	3.5:1	3:1
Resp. Quotient	.84	.77	.72	.71	.71	.72	.73	—
Acetone in breath (c)	0	.8	2.1	2.4	2.8	3.8.	4.3	4.1
Number of Attacks *Max.*		36	27	16	13	0	0	0
Observed Daily *Min.*		13	5	5	0	0	0	0
Aver.	20	22	12	10	4	0	0	0

(a) 10 grams of $NaHCO_3$ given daily
(b) In grams
(c) Expressed in hundredths of milligrams acetone per liter of expired air.

Weight. The child lost 2.3 Kg. (5 lbs.) in weight during her forty days on the diet in the hospital; probably all or most of this loss was water. One year later (Nov. 22, 1928) she weighed 31.1 Kg., a gain of 2 Kg. since discharge from the hospital; she had been on a ketogenic diet since discharge.

Dict. She continued on the diet given at discharge for six months. It was then gradually changed until she now gets a diet of Carbohydrate 94 grams, Protein 60 grams, and Fat 154 grams; 2,000 Calories. Her appetite is good. She has never been finicky about her food and has coöperated very well. It is our intention not to increase the carbohydrate in her food for another year.

Acetone. The amount of ketosis is represented by the amount of acetone in one liter of expired air. The acetone is seen to increase as the carbohydrate in the diet diminishes.

Convulsions. The convulsions were petit mal attacks, lasting from two to thirty seconds. As many as thirty-six were observed on one day; many doubtless were not seen. On October 25 there were thirteen very light convulsions; after that date there have been none.

Mentality. About October 1, a few days before admission to the hospital, she had a mental test and the psychologist reported an intelligence quotient of 102; in February, after she had been for four months on the diet, and convulsions had ceased, she was reëxamined, and showed an intelligence quotient of 134. It would seem that the petit mal seizures had caused injury to the brain cells; when attacks ceased, the brain cells were no longer affected, but recovered and the intelligence increased. The mental deterioration seen in epileptics is doubtless due to injury or death of brain cells, and is usually the result of the epileptic attacks.

The main cause for failure by some doctors who have not been successful in treating their epileptic patients by this diet seems to have been (a) that the diet has not been followed long enough (I have seen a number of cases where the convulsions did not stop until the patient had been on the diet five weeks to five months); (b) that the amount of carbohydrate had not been cut low enough; frequently one must give as low as 10 or 15 grams per day; (c) that the parents, for some reason or other, have not coöperated very intelligently. Psychological as well as dietetic technique is important; it is necessary to have the coöperation of the child for real success.

My plan today in discussing epilepsy as treated by the ketogenic diet is not only to show its value, but also to discuss why it is of value. Nine usual and approved medical procedures for treating epilepsy that have been tried with some degree of success, are given as follows:

1. Administration of Sedative Drugs, as bromides or luminal.
2. Low Protein Diet.
3. Administration of Catharties or Laxatives.
4. Removal of Foci of Infection.
5. Low Sodium Chloride Intake.
6. Fasting.
7. High Fat-Low Carbohydrate (Ketogenic) diet.
8. Feeding Acidophilus Bacilli.
9. Low Fluid Intake.

The more important physiological and pharmacological effects of each of these procedures are outlined in Table III, the numbers at the head of the column representing the procedures as listed.

The chart, for the most part, is probably quite obvious. The sedative action of fasting and ketogenic diets is ascribed to the pharmacological action of acetone. Changes in the fat, and especially of the cholesterol of the blood, have been noticed before an epileptic attack. Hypoglycemia has been noticeable in patients on the ketogenic diet; a blood sugar as low as .05% is not uncommon. The variation in blood chemistry incidental to the taking of food is not present in the fasting individual.

(1) The sedative action of acetone, (2) the

lipemia, (3) the hypoglycemia, (4) the acidosis, (5) the diminution of diurnal variations in the blood chemistry, (6) the diminution of the fluid of body tissues, and (7) changes in the bacterial flora, each has been ascribed as the cause of the relief from epileptic attacks following a ketogenic diet. Personally, I am inclined to believe that a combination rather than any one factor alone relieves the epilepsy.

Two of these physiological effects of the ketogenic or high fat diet have been chosen for fuller discussion:—the changes of intestinal bacteria and the quantity of fluids held by the tissues.

The field of intestinal bacteriology is an enormous one. Investigators have estimated that a healthy adult excretes daily 100,000,000,000 to 3,300,000,000,000 bacteria. Any but the most sketchy understanding of these bacteria is obviously impossible. That they do play a pathological rôle in some conditions is certain, as in typhoid fever and bacillary dysentery; in other conditions it seems quite likely that they may.

Auto-intoxication or intestinal toxemia, i.e.—clinical symptoms from toxins or by-products of bacterial metabolism in the intestine which are absorbed by the body, clearly have some standing in clinical symptomatology and therapeutics, especially in certain of the chronic illnesses, as arthritis and epilepsy.

About 10 years ago, a well-known surgeon described a "bacillus epilepticus" which was present in the intestine of several of his epileptic patients and which seemed by experimental evidence to cause epileptic attacks. It was a very plausible story, for constipation and epileptic attacks go hand in hand and catharsis often prevents attacks. Other workers were unable to confirm this work and the author later retracted his statements and admitted he was in error. This incident is interesting in showing the trend of medical thought.

Our experimental observations show that the stools were more acid when the patient received a ketogenic (high-fat) diet than a normal high-carbohydrate diet. Table IV gives data from one of our patients. The change is definite, although not so striking as it is in urine when acidosis exists. Incidentally, this indicates another mechanism in the control of the acid-base equilibrium of the blood. The two prominent factors, the kidney and the breath, for excreting acid (and base) are supplemented by a third, the bowels. This mechanism is being studied in our laboratory.

With the change of reaction of the stool, a change in the type of organisms was sought. Most bacteria vary much in their growth according to the reaction of the media. Thus in milk, streptococcus lacticus will multiply rapidly until there is ½% lactic acid present; bacillus bulgaricus similarly multiplies until the lactic acid reaches 1½% or 2%, while only molds and torulae develop if the acid content is much above that figure.

Examination of smears of stools showed essentially the same organisms when the patient received a high-fat as when he received a nor-

TABLE III

	1.	2.	3.	4.	5.	6.	7.	8.	9.
Sedative Action (Nervous System)	++	0	0	0?	0	++	++	0	0
Lowered Total Metabolism	+	+	0	0	0	++	0	0	0
Predominance of Fat Combustion	0	0	0	0	0	+	++	0	0
Lowered Nitrogen Metabolism	0	+	0	0	0	+?	0	0	0
Lipemia	0	0	0	0	0	+	+	0	0
Lowered Glycogen Store	0	0	0	0	0	++	++	0	0
Hypoglycemia	0	0	0	0	0	+	+	0	0
Conservation of Kidney Function	0	+	+	0?	+	+	0	0	0
Reduced Salt Content of Body	0	0	+	0	++	+	0	0	0
Acidosis	0	0	0	0	0	+	++	0	0
Less Tissue Fluids	0	0	++	0?	++	+	+	0	++
Blood Chemistry shows little Diurnal Variation	0	+	0	0	0	++	0?	0	0
Bacteria of Intestines Diminished or Flora Changed	0	0?	++	0?	0	++	+	+	0

TABLE IV

pH of Stools	Pt. A.L.
Normal Diet	7.55
F:P+C= 1:1	7.80
1.5:1	7.50
2:1	7.35
2.5:1	7.35
3:1	6.85
1:1	7.30

TABLE V

DAILY NITROGEN EXCRETION IN STOOLS

Period	Ratio	Diet Fat (grams)	Carbohydrate (grams)	Nitrogen in Stools (grams)
I	1:4	80	280	.81
II	1:11	40	400	.90
III	1:1	154	114	.38
IV	2:1	180	50	.80
V	3:1	190	23	.36
VI	4:1	200	10	.30

Protein in Diet—40 grams in each period.
Calories 2000 per day in all periods except II (2120).
The ratio is "Fat:Protein plus Carbohydrate" in grams.

mal diet, although there were possibly relatively more gram-positive organisms when the patients were on the fat diet. Decided changes did not occur.

But although a qualitative change in the bacteria was not proven, a quantitative change was found. The stools of the epileptic patients on the high-fat diet were noticed to smell less foul than when they were on a carbohydrate diet. Observations on one patient are given in Table V.

Although the protein of the diet was the same, the nitrogen of the stool was very much lower when the patient was on the high-fat diet.

Our interpretation of this finding is that there is less nitrogen in the stools when on the ketogenic diet, because there are less bacteria,—for bacteria account for 50 to 80% of the fecal nitrogen.

If one analyzes these results, the findings are quite as one would expect. Bacteria grow best and fastest on carbohydrate containing media; the same rule holds true both inside and outside the body. One thus expects more bacterial activity in the intestine when the patient receives a carbohydrate-rich diet than when he has a high-fat diet.

Table VI shows another group of observations on the quantity of intestinal bacteria. A five months old baby was put on the following diet:—

Milk 24 ounces
Water 12 ounces
Carbohydrate 2 ounces
6 feedings of 6 ounces each.

This mixture contains approximately Protein 2.3%; Fat 2.3%; Carbohydrate 8.6%. Although the diet is possibly slightly high in carbohydrate, it is practical for a normal child; this child took the feeding well and gained satisfactorily in weight.

The type of added carbohydrate was varied. The periods lasted about four days each; the child was on the new diet for several days before the period began. In each period the child had a positive nitrogen balance. In the periods with cane sugar the nitrogen in the stools was lowest, averaging .155 grams daily; next was dextrose, with a nitrogen in the stools of .19 grams; in turn come dextri-maltose with .23 grams, lactose with .27 grams, cornstarch .31 grams, and banana flour with .97 grams. There was about twice as much nitrogen in the stools when lactose was used as when cane sugar or dextrose; this suggests twice as many bacteria and twice as much intestinal bacterial activity. The more quickly absorbed sugars and carbohydrates led to the less intestinal bacteria.

Clinically, the lactose-fed child tends to become "colicky", and is more likely to have diarrhea. It is a race between the body and the bacteria as to which is to get the value of the food; the slowly absorbed food is the one which the bacteria are able to obtain.

As for the huge amount of nitrogen in the stools in the banana flour experiment, no explanation is now attempted; but it may have some bearing on the explanation of the success of banana feeding in the child with chronic intestinal indigestion.

In the recent literature, attention has been directed to the qualitative aspect in intestinal bacteria; attention has been given as to how many gram-positive organisms and how many gram-negative organisms there are in the stools, and as to the value of implanting more of the acidophilus bacilli in the intestinal flora.

May I emphasize the quantitative aspect as being quite as important? The best way to reduce the quantity of intestinal bacteria is by starvation. At the Nutrition Laboratory of the Carnegie Institution of Washington in 1912, a man, A. L., fasted 32 days. He had a stool on the second day of his fast and no other until after he ate food; here intestinal bacteria persisted, but did not multiply. Fasting is an ideal treatment for acute diarrhea, and intestinal disturbances. Next to fasting, the high-fat diet keeps intestinal bacterial activity at a minimum. Therapeutically, we have tried high-fat diet as a means of eliminating intestinal toxemia in chronic arthritis; good results were obtained in two cases of Still's disease, but cases of arthritis sometimes improve with no treatment. Thus, I suggest a high-fat diet in cases where one wishes to treat an intestinal toxemia, or focus of infection. Instead of giving so much fat as on the ketogenic diet, equal quantities of fat and carbohydrate are usually sufficient to produce the desired effect.

The epileptic brain is a wet brain; at opera-

TABLE VI

DAILY NITROGEN INTAKE AND OUTPUT

Baby McLean — 5 months old

Period	Carbohydrate	Grams of Nitrogen (Food	Urine	Stools	Balance)
I	Lactose	3.65	2.13	.28	+1.24
VI	Lactose	3.62	2.11	.25	+1.26
IX	Lactose	3.90	2.52	.28	+1.10
II	Sucrose	3.64	2.22	.18	+1.24
VIII	Sucrose	3.57	2.29	.13	+1.15
III	Dextrose	3.52	2.22	.19	+1.11
IV	Dextri-maltose	3.43	2.44	.23	+0.76
V	Corn Starch	3.81	2.42	.31	+1.08
VII	Banana	3.74	1.43	.97	+1.34

tion the meninges are found to be edematous and often cystic. It would seem possible that if this edema could be diminished, the patient might be relieved of his epileptic seizures. If one could reduce the body fluids, he might secondarily reduce edema of the brain.

Two common methods of dehydrating the body are by (1) fasting and (2) withholding sodium chloride. The weight curve of Benedict's fasting man is shown in Chart I. In the first few

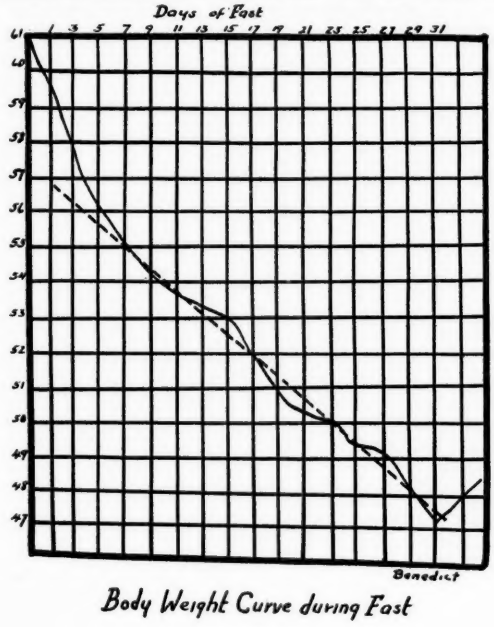

CHART I.

days of fasting, the loss of weight was more rapid than in the subsequent days; this increased loss of weight was largely water. Similarly, Chart II is the weight curve of a man

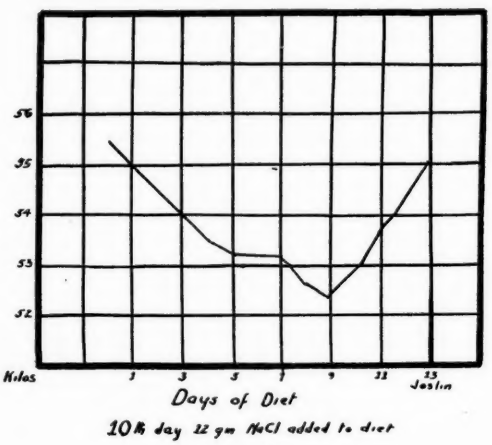

CHART II.

deprived of sodium chloride. Considerable weight was lost as water, which was regained when salt was given.

A low-carbohydrate diet also causes a loss of body fluid. The amount of water in the tissues varies closely with the amount of sugar (glycogen) in the tissues. An instance of this is in the baby who has been fed on condensed milk; if a change is made from the condensed milk to a feeding with lower sugar content, as protein milk, a twelve-pound baby will lose about a pound in two or three days; the loss is largely water. Similarly, when epileptic patients are changed from a high-carbohydrate diet to the high-fat or ketogenic diet, they lose weight.

Dehydration of the tissues is used therapeutically in several conditions. Magnesium sulphate solution is sometimes employed locally to relieve edema in erysipelas and other skin infections; apparently the body is better able to overcome the infection if there is no edema. In grippe and tonsillitis, the giving of a cathartic usually aids in making the patient feel better; it may be because the patient has gotten rid of a certain amount of fluid. Hypertonic solutions and magnesium sulphate solutions are used intravenously in anuria and in certain cases of poliomyelitis and encephalitis to reduce the edema of the kidney and brain.

I have noticed that children on a ketogenic diet are probably less frequently and less severely sick with the common respiratory infections. Last month, in a family of five, all were sick with a prevalent grippal infection. The mother was in bed with a temperature of 103 degrees; two children were sick in bed; the father felt miserable, was nauseated and should have been in bed; a boy of five, under treatment for epilepsy by the ketogenic diet, had apparently also gotten the infection; he lost his appetite for one meal and then felt well again. This boy withstood the infection much better than the other members of the family who were on a normal diet. This is not unusual, for in many of our cases, the child on the ketogenic diet is the healthiest member of the family so far as respiratory infections are concerned. A similar condition is seen in the diabetic; as soon as he is sugar-free, his tendency toward infection diminishes and also his ability to overcome boils or abscesses is increased. These clinical findings may quite well be explained by a relative dehydration of the body and its individual cells.

Thus may not high-fat diets have a place in the routine prevention and amelioration of the common respiratory infections? I distinctly favor the omission of candy and the definite limitation of sugar and starches in the diet in the winter as a prophylaxis against colds. It is hardly necessary to limit the carbohydrate to the extent of making it a ketogenic diet.

Most patients take a high-fat diet surprisingly well; they seldom have gastro-intestinal upsets, certainly no more frequently than the average person on the usual high-carbohydrate diet. If such an upset occurs, starvation is recommended temporarily.

Patients on the high-fat diet complain of some difficulty in doing hard and prolonged muscular

work. To do work, sugar or glycogen seems necessary.

In applying these facts and suggestions regarding the therapeutic use of high-fat diets, the individual patient and the factors in his case must be given first consideration.

A HELMET FOR USE IN CLINICAL STUDIES OF GASEOUS METABOLISM*

BY FRANCIS G. BENEDICT, PH.D.†

A METHOD for collecting the products of respiration of a human subject is essential in studies of respiratory metabolism. Perhaps the ideal arrangement is where the subject is inside a comfortable, well-ventilated respiration chamber, under which conditions the respiration may be assumed to be normal. The respiration chamber is expensive and usually impracticable for use in the hospital, the clinic, or, indeed, the general physiological laboratory. Even in the early days of Lavoisier, attempts to collect the products of respiration directly were made by the use of a face mask, and since that time various forms of breathing appliances have been employed, such as the mouthpiece, the half-face mask, the full-face mask, and the inflatable nose pieces[1]. All of these appliances are successful with well-trained subjects, at least for the determination of the total metabolism from the oxygen consumption, but to untrained subjects all of them are, at least at first, disturbing. They are difficult to attach and considerable time is frequently needed for the adjustment, especially with the face mask. They are uncomfortable to wear, indeed at times painful, and so great is the discomfort frequently that even the hardiest of untrained subjects will not permit a continued study much longer than one-half hour, representing possibly a series of three 10-minute periods. In the case of the mouthpiece, the nose clip needed is an added aggravation, often producing a burning sensation which, with a large number of subjects, precludes its use. What is true of either well-trained subjects or zealots in physiological laboratories is infinitely truer with temperamental patients in the clinic, and hospital laboratories are today confronted with the difficulty of securing a suitable respiratory appliance that will not be violently disliked by most patients. A quickly attachable, comfortable breathing appliance seems to have been found at present in the simple form of helmet here described.

Development of helmet. In 1898 Rubner, by means of a ventilated chamber for the head alone, measured the water vapor given off from the lungs under conditions of rest, reading aloud, and singing[2]. No determinations of the carbon-dioxide production or the oxygen consumption were reported. Later, E. Grafe[3] also devised a head respiration chamber. This apparatus was large and unnecessarily cumbersome, and a great deal of care was required to wrap a length of rubber bandage tightly around the patient's neck, a rather formidable procedure. Subsequently, in discussion between the author and Professor Grafe, the latter stated that he did not plan to carry the development of his apparatus further. The Nutrition Laboratory, believing in the fundamental principle of Grafe's idea, therefore devised a simple type of helmet. In its original form this helmet consisted of a 12-quart, galvanized iron water-pail with celluloid window. This was inverted over the head, and closure between the helmet and the neck was secured by a rubber collar or woman's bathing cap, with a hole cut in it of suitable size for the neck. This head chamber was first used only as an open-circuit apparatus for the determination of the carbon-dioxide production[4] and as such was demonstrated at the Carnegie Institution of Washington in Washington, D. C., in December 1926. With this equipment and with gas analyses the respiratory quotient could be studied, and observations were secured in a preliminary study of the respiratory quotient as affected by the type of breathing appliance[5]. In the first brief description of the apparatus in 1927[4], a hint was given that the closure about the neck was sufficiently tight to permit of using the helmet as a breathing appliance in a closed circuit. Indeed, three curves were published, illustrative of the graphic record of the oxygen consumption obtained when the helmet is connected with a spirometer in a closed circuit. Since 1927 the helmet has been used extensively as a closed-circuit apparatus[6], and in this form it was demonstrated at the XIIIth International Congress of Physiologists in Boston, in August 1929, and at the Carnegie Institution of Washington in December 1929.

DETAILS OF THE HELMET

The present form of helmet (see figure 1) most commonly used in the Nutrition Laboratory retains the water-pail shape of the original, primitive assemblage, but in order to simplify the soldering to it of necessary tubes, the pail is made of sheet copper instead of galvanized iron. In height the pail measures 23 cm. The inside diameter of the top (inverted bottom) is 22 cm. and that of the bottom or open end 27 cm. An opening into which a window is fitted extends about one-third around the helmet.

*From the Nutrition Laboratory of the Carnegie Institution of Washington, Boston, Massachusetts.

†Benedict—Director Nutrition Laboratory, Carnegie Institution of Washington. For record and address of author see "This Week's Issue", page 182.

Across the top of the helmet is soldered a tube, on the under side of which is a wide slot connecting with an opening cut in the top of the pail itself. At the end of this tube are two openings, through one of which, *A*, air passes into the helmet. The other opening, *B*, connects with an expansion chamber or spirometer. This tube, with its two openings, is so placed on the top of the helmet that the helmet can be worn comfortably in the lying position as well as in the sitting and standing positions. Near the bottom, at one side of the window, is another tube, *C*, through which the air leaves the helmet. To deflect the incoming air so that it does not strike directly upon the head, a baffle plate, *D*, is attached to the inside of the top of the helmet. The circular wall of the vessel is extended a short distance above the top or closed end, and in this extension are four small holes fitted with rings and chains leading to a common ring, from which the pail can be suspended vertically when the patient is sitting or standing.

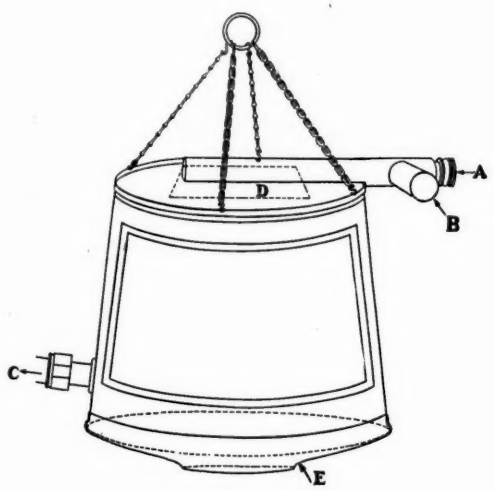

FIGURE 1. *The helmet.*

A, opening for incoming air; *B*, opening connecting with a spirometer or expansion chamber; *C*, opening for outgoing air; *D*, baffle plate to deflect incoming air from top of subject's head; *E*, rubber bathing cap forming closure around neck.

The most important feature of the helmet is the closure around the neck. Originally we employed a standard, pure gum, woman's bathing cap. (See E, figure 1.) The opening (slightly reinforced by extra rubber) of this cap is stretched over the bottom or open end of the pail. The rim of the pail's open end is formed over wire rod, so that there are no sharp edges over which the rubber must go. A stout rubber band is snapped around the bathing cap where it is attached to the helmet, thus making the closure still tighter. Before the rubber cap is attached to the helmet, a small hole is cut with scissors in what was originally the top of the bathing cap. Since these caps are of pure gum, this cut opening can easily be stretched over the head of the patient and will contract again and fit closely around the neck. Hundreds of experimental periods have been carried out with precisely this type of closure. Subsequently the manufacturer (the Davol Rubber Company of Providence, Rhode Island) made for us a special cap with an opening for the neck reinforced by a little heavier rubber. This special cap, which is now regularly used, is circular, with a diameter over-all of 25 cm. It has *two* openings, which are likewise circular. The larger opening, which fits over the bottom of the helmet, is 17 cm. in diameter. The smaller opening, which goes around the neck, has a diameter of 7 cm. Both openings are slightly reinforced with extra rubber, to prevent tearing.

The connections to and from the helmet are made ordinarily by standard, ¾-inch, hose couplings, and soft rubber gaskets easily screwed together with the hand. The window is of celluloid. It is fitted into grooves soldered to the inside of the helmet where the opening is cut. The celluloid is waxed in place inside the helmet with physicist's wax.

The features of this helmet which make for comfort are the absence of nose clip, the fact that nothing is placed between the teeth and the lips which would stimulate the saliva, and the light closure of thin rubber dam around the neck, a closure which causes no greater constriction than the ordinary rubber collar frequently placed about the neck when the hair is being cut. We recognize clearly that modifications of this helmet are possible in many directions. The inverted water-pail type is by no means the ideal form, although it is the simplest and perhaps the most easily constructed and most widely applicable. One could conceive of a helmet constructed of aluminum (with a glass window) or perhaps of papier mâché. A stouter rubber diaphragm may be used, but our own judgment is that excellent results can be obtained with the helmet as here described, which has the advantage of being quickly and easily reproduced.

ADJUSTMENT OF THE HELMET TO THE HEAD

It is imperative that in all cases the neck should be in the center of the opening of the rubber collar. In other words, the rubber diaphragm must not be drawn off to one side, for there would be danger of leakage of air. When, as in hospital use, the patient is lying down, the neck should be centered in the opening and the head comfortably cushioned by placing a padding of towelling or some other soft material *inside* the helmet between the head and the metal of the pail. When the subject is sitting, the helmet should be suspended in such a way that the neck will rest easily in the center of the rubber opening. An alternative is to draw the bathing cap more snugly on one side of the helmet (usually the side opposite the window) and thus bring the natural opening "off center". But all ten-

sion upon the neck tending to pull the rubber away from the neck must be avoided.*

As an aid in securing an air-tight closure of the rubber collar around the neck, especially with a woman, whose hair in the nape of the neck may cause a slight leak, a few drops of any glycerine preparation may be rubbed on the neck.

METHODS OF STUDYING THE RESPIRATORY EXCHANGE WITH THE HELMET

Theoretically, the helmet might be considered as replacing any of the standard respiration appliances: mouthpiece, nose pieces, or face mask. Practically, it cannot be substituted for these appliances in many of the common types of respiration apparatus. Thus, it may not be employed in any of the apparatus having inspiratory and expiratory valves. Consequently the helmet can be used only with a ventilated circuit and is thus to be considered as a small respiration chamber. The conditions determining the ventilation of any respiration chamber are usually dictated by simply one requisite, that is, the maintenance of the air in the chamber in a respirable form. Theoretically, outdoor air should enter the chamber and in such an amount that the products of respiration are removed rapidly enough to avoid any serious disturbance of the mechanics of respiration. In practically all the laboratories in which different types of humans and animals have been studied the carbon-dioxide content of respiration chamber air has, by common consent, been permitted to be not far from 1 per cent. The helmet may, therefore, be used in a ventilated circuit of air having this carbon-dioxide content, to study the respiratory exchange by any one of the three well-established principles: (a) determination of the carbon-dioxide exhalation alone, (b) determination of the oxygen consumption alone, and (c) the far more difficult determination of both of these factors.

DETERMINATION OF CARBON-DIOXIDE EXHALATION ALONE

The method of determining the exhalation of carbon-dioxide only as a measure of basal metabolism is used almost exclusively by Dr. John T. King of Baltimore with great success[7]. For accurate measurements of the carbon dioxide exhaled and especially for the interpretation of such measurements normal respiration is necessary; hence the helmet is particularly suited for such determinations. Its first use in the Nutrition Laboratory was, as a matter of fact, exactly in this type of test[4]. The helmet was employed in the following manner. Carbon-dioxide-free air was supplied to the helmet by a small rotary air impeller, which forced outdoor air, first, through soda-lime to absorb the carbon dioxide. The air was drawn out of the helmet by a rotary blower of the Crowell type,* which sucked the air, first, through sulphuric acid to dry it completely and then through a bottle of soda-lime followed by another sulphuric acid bottle. These last two bottles were weighed at the beginning and end of each observation and thus the weight of carbon dioxide was readily determined in periods of any desired length. To provide for free expansion and contraction of the air in the helmet with each inspiration and expiration, a small cylindrical can with a rubber bathing cap was inserted between the helmet and the first sulphuric acid bottle.

With this simple apparatus alcohol check experiments, made by burning known amounts of alcohol, showed an extraordinarily satisfactory agreement. A series of six periods, each of about twenty minutes' duration, gave results that were 100.3, 99.8, 97.2, 102.1, 98.9, and 99.8 per cent., respectively, of the theoretical amount of carbon dioxide produced. However, a much more important and physiologically interesting test of the apparatus was the uniformity of the carbon-dioxide production of the same individual from period to period. In metabolism experiments where gas analysis plays a rôle, the variations in the measurements of the carbon-dioxide production per minute are rather considerable. The results of two typical physiological tests of the helmet as used for the determination of the carbon-dioxide exhalation alone are given in table 1, from which it can be seen that the measurements were extraordinarily uniform. Although we are by no means in sympathy with the use of the carbon-dioxide measurement alone as an index of the metabolism, we believe that the helmet does contribute to normal respiration and to great uniformity in the carbon-dioxide production, conditions which are prerequisite for the most accurate measurement and interpretation of this factor.

Table 1. Physiological tests of helmet apparatus by measurement of carbon-dioxide production in several successive periods.

(CO_2 in c.c. per minute)

Period	Subject I	Subject II
I	199	212
II	201	210
III	204	207
IV	197	209
V	198	209
VI	192	211
VII	202	
VIII	205	
IX	194	
X	195	
XI	195	

*When the neck is perfectly centered in the rubber opening, the nose nearly touches the celluloid window and between the back of the head and the metal pail is considerable padding. Conceivably, by having the opening in the rubber diaphragm somewhat off center, less padding could be used and, particularly when the subject is lying down, the adjustment for tight closure made even more rapidly and securely. Experiments to this end with special diaphragms with holes made somewhat off center are in progress.

*Furnished by the Crowell Manufacturing Company of Brooklyn, N. Y.

DETERMINATION OF OXYGEN CONSUMPTION ONLY

With the vast majority of metabolism apparatus used at the present day, the oxygen consumption alone is determined. This applies to the various forms of apparatus developed in the Nutrition Laboratory, to the Krogh apparatus, and to the many other forms that are finding a valuable place in the clinic. Heretofore these apparatus have required mouthpiece and nose clip. In the closed-circuit type of apparatus it is imperative that there should be no leak anywhere in the circuit, a pinhole leak being disastrous. In the early stage of our development of the helmet it was a question whether the closure of the helmet around the neck would meet this stringent requirement, but to our considerable surprise we found that this closure was perfect enough so that the helmet actually lent itself to accurate determinations of the oxygen consumption[4]. Since that date innumerable experiments have been made in the Nutrition Laboratory in which this fact has been fully confirmed.

It is the belief of the Nutrition Laboratory that in the ideal form of closed-circuit apparatus for measuring oxygen consumption only, valves are not to be employed, but the work of ventilating the apparatus, moving the air along the tubes and forcing it through soda-lime, should be done entirely by a mechanical blower. Under these conditions the lungs have only to raise and lower a delicately counterpoised spirometer, and hence can be said to do practically no work. The helmet as applied to this type of closed-circuit apparatus is shown in figure 2. Air is withdrawn from the helmet at the lower opening, is drawn through soda-lime where the carbon dioxide is removed, enters the blower, *B*, and then passes back to the top of the helmet. The spirometer, *S*, which has a capacity of from 6 to 9 liters, is connected at one side and is not directly in line, so that the air enters and leaves it in a wavelike motion but does not pass through it. A graphic tracing is secured on a kymograph drum, *K*, of the up and down movements and the change in level of the spirometer bell, the closed system being filled with air somewhat enriched with oxygen. If a spirometer bell approximately six inches in diameter is selected, a fall of one millimeter in the bell would correspond to an absorption of about 21 c.c. of oxygen. With the average individual, under basal conditions, the bell would fall in ten minutes about one hundred millimeters. One can thus write graphically on the kymograph drum the entire oxygen consumption during a 10-minute rest period.

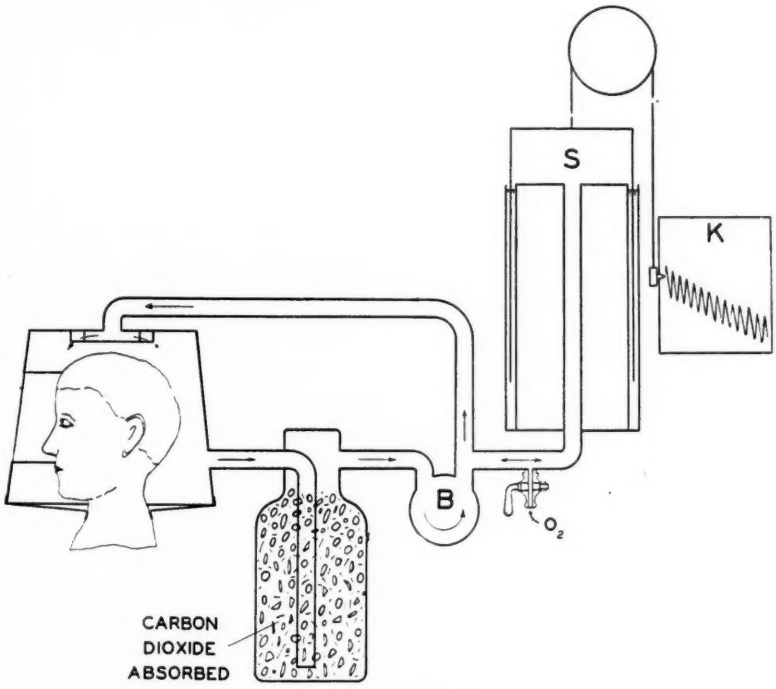

FIGURE 2. *Schematic outline of the helmet in a closed-circuit respiration apparatus.*

The blower, *B*, draws the air from the helmet through soda-lime, where the carbon dioxide is removed, and discharges it into the top of the helmet, enriched with oxygen from the spirometer, *S*. A graphic tracing of the oxygen consumption is secured on the kymograph, *K*.

An illustration of the helmet apparatus in actual use during the measurement of the oxygen consumption of a patient at rest is given in figure 3. Ordinarily oxygen is introduced into the closed system only periodically, that is, at the end of a given period, which is usually from 10 to 15 minutes. In contradistinction to the

usual practice with the mouthpiece or the face mask, the helmet is not removed from the patient's head during the test, but several consecutive periods of measurement are carried out without interruption. Since the helmet can be worn with comfort for two or more hours, it is feasible to introduce oxygen into the system through a calibrated wet gas meter at such a rate as to hold the excursions of the spirometer bell at a constant level. The oxygen consumption is then read directly on the meter. This method we have used in an extended study of the effect of mental effort on metabolism[8].

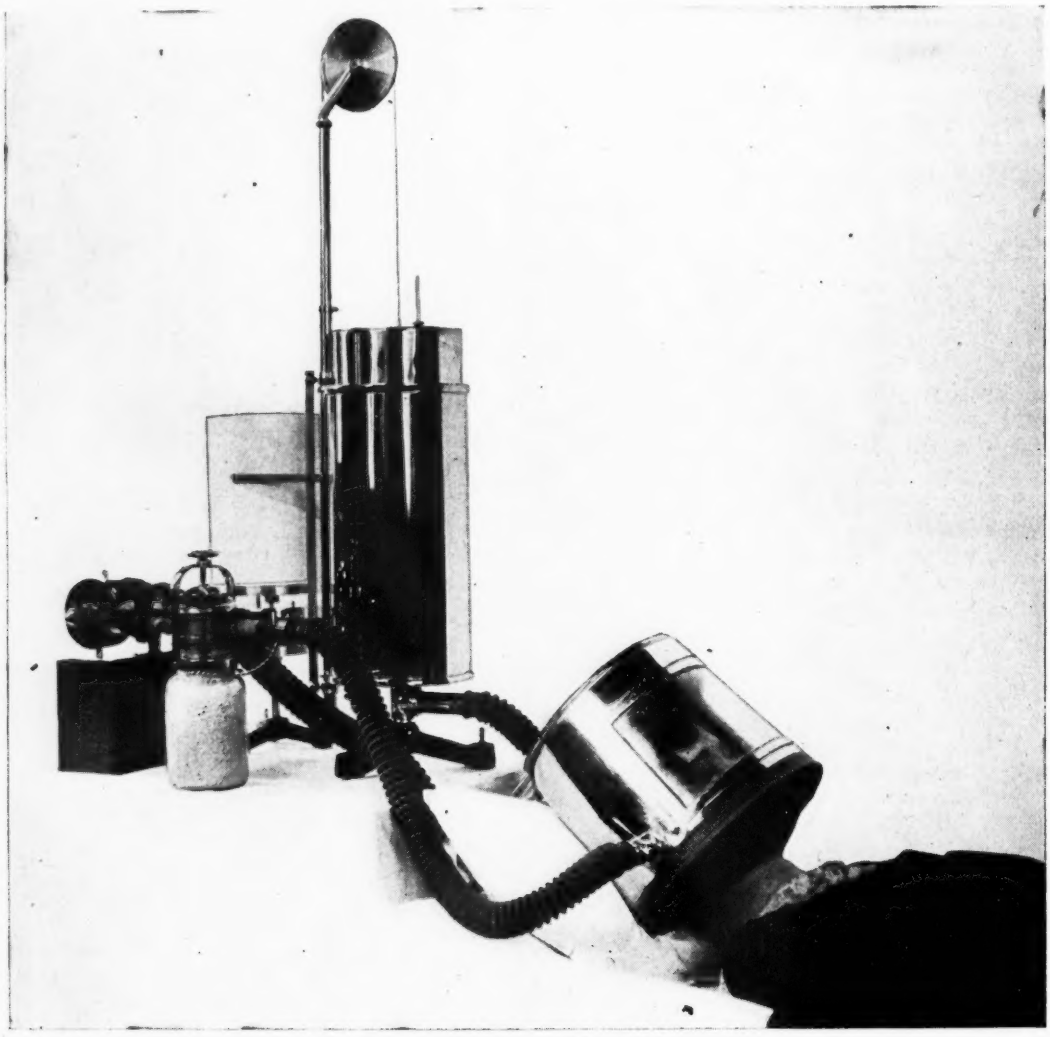

FIGURE 3. *The head chamber or helmet apparatus as arranged for measuring the oxygen consumption of a human, at rest.*

In the closed-circuit apparatus there should be a minimum resistance between the helmet and the spirometer. The spirometer should, therefore, be as near the helmet as possible, but obviously not within view of the patient and not directly in line in the air circuit. The connection should be made by means of a rubber hose at least one inch in internal diameter. Thus there is no direct current of air through the spirometer, but there will be a wavelike motion of air out of the spirometer into the helmet and back again, with each respiratory cycle. The length of connecting tubing should be reduced to a minimum. The more resistance there is between the spirometer and the helmet, the greater the changes in pressure inside the helmet (slight though they really are) and consequently the greater the movement of the rubber diaphragm neck band. It is desirable to have a maximum excursion of the spirometer for recording the characteristics of respiration. With a loose, flexible, or moving neck band a not inconsiderable part of the change in volume may take place around the neck band rather than in the spirometer itself. A rigid neck band is impracticable, but minimum pressure changes inside the helmet can be secured by observing the above suggestions.

In warm weather the air inside the helmet is apt to be a little warm. Two methods of cooling it are possible. If a dry soda-lime, such as

"shell natron,"* is used, or if a second bottle containing calcium chloride is placed after the carbon-dioxide absorbing reagent, the air will enter the helmet essentially dry and thus *will cool* the face by evaporation of moisture. Another method is to place a piece of wet cheesecloth or linen over the helmet and have a small electric fan blowing over it. Either method is successful.

Since the fundamental principle of closed-circuit respiration apparatus is the measurement of the oxygen absorbed from a system of definite volume, any leak, even a pinhole, in the system is detrimental. The testing of an apparatus of this kind for leaks is simple. If at any period during the experiment, after the slope of the tracing indicating the oxygen consumption has been fairly well established, a 30-gram weight is placed on the spirometer bell, there will be a slight distention of the rubber collar about the neck, thus making a distinct break in the curve, but the tracings of the up and down movements of the bell will remain at the same slope as the original slope, provided there is no leak. If a leak exists, there will instantly be a marked change in the slope of the curve. Consequently it is possible to test this type of apparatus for tightness in each period during the actual progress of the experiment itself. With proper adjustment leaks rarely occur. In fact, we have found that even in muscular work experiments involving considerable head movement (as in riding a stationary bicycle or in work on an ergostat),† the closure of the helmet has remained tight and the slope of the curve has not changed when the weight has been placed on the spirometer bell. The absence or presence of a leak with the helmet may thus be definitely proved by this simple test. With the closed-circuit type of apparatus here described, whether employing helmet, mouthpiece, or nosepieces, this method of testing is to be recommended. Indeed, this method is unique for the closed-circuit type of respiration apparatus. All other types employing mouthpiece or face mask with gasometers or gas meters allow the testing of the closure *prior* to the experiment and possibly *after* the experiment (which is never done), but not *during* the experiment.

A physiological control of the helmet apparatus for measurement of the oxygen consumption alone has been made, in which the subject wore alternately the helmet and then the mouthpiece in a series of several periods. The measurements obtained with the two types of breathing appliance showed perfect agreement.

*Sold under the name of "shell natron" by the Uehling Instrument Company, 473 Getty Avenue, Paterson, New Jersey. Shell natron, used as delivered from the manufacturer, is large and bulky, but very efficient in absorption. By crushing, it can be reduced to a smaller size, but we have experienced the danger of having the crushed material, which in this case absorbs both water vapor and carbon dioxide, become so impacted as to close completely the passage of air. Since a rotary air impeller is used, there is no visible evidence of the movement of air and rebreathing may occur. By introducing a flow meter, such as a rotamesser, the free movement of air is always visible. If a soda-lime such as the Wilson or the modified Haldane form is used, clogging is rarely experienced.

†The extraordinary potentialities of Johansson's ergostat[9] have recently been emphasized by Abramson[10].

DETERMINATION OF BOTH CARBON-DIOXIDE PRODUCTION AND OXYGEN CONSUMPTION BY THE USE OF THE HELMET

Having seen that the use of the helmet is especially advantageous in determining the carbon-dioxide production only, and that it is equally applicable to the numerous forms of closed-circuit respiration apparatus with which the oxygen consumption alone is measured, we naturally ask: Can the helmet be used in an apparatus in which both gaseous factors can be determined, so that the much desired respiratory quotient can be secured? In view of the normal type of respiration afforded by the helmet, one would expect this to be an ideal breathing appliance for the determination of the respiratory quotient. As a matter of fact, the helmet has been used successfully in the Nutrition Laboratory for determining the respiratory quotient, and, indeed, by two entirely independent methods. One method has been to combine the weighing of the carbon dioxide given off during a given time with (a) the change in the tracing of the oxygen absorption or (b) the measurement of the oxygen admitted to the closed system by a meter, the spirometer tracings being held at a constant level. The second method has been to employ the helmet as a breathing appliance or as a small respiration chamber, ventilated (as in the case of the first method) with carbon-dioxide-free outdoor air, but instead of passing the air through sulphuric acid and soda-lime to absorb and weigh the carbon dioxide, the total ventilating current of air is metered on a dry gas meter, and an aliquot sample is analyzed in the exceedingly exact gas-analysis apparatus of Carpenter[11]. Both of these methods have been subjected to the usual rigorous alcohol check tests, in which definite amounts of alcohol of known composition were burned and careful observations made of the amounts of carbon dioxide recovered and oxygen consumed, and particularly the ratio between these two as expressed by the respiratory quotient. Technically both methods are most satisfactory.

The significance of the respiratory quotient in studying gaseous metabolism, the difficulties of obtaining it under ordinary conditions, and the interpretation of the respiratory quotient as an index of the character of the material burned, are all intricate problems that cannot well be discussed in detail here. Suffice to say, however, that we believe the helmet, preferably with an open-circuit apparatus and the Carpenter gas-analysis apparatus, gives the most normal and satisfactory method for measuring the respiratory quotient that we have thus far found in our experience. It remains a fact, however, that a large proportion of clinical measurements of

metabolism deal with the basal metabolism alone, and that the usual gasometric analysis of necessity demands a measurement of the carbon-dioxide production and an approximation of the respiratory quotient, which are rarely of use. The closed-circuit method, employing the helmet, blower, soda-lime and spirometer, gives a quick, accurate, comfortable means for determining the oxygen consumption of patients without gas analysis and with the least effort, and admittedly the oxygen measurement is an extremely close index of the total metabolism.

OBJECTIONS TO THE HELMET

Technically, the greatest objection to the helmet is the possibility of an incomplete closure about the neck. Incomplete closure would result in either a loss or a gain of air in the ventilating circuit, which, depending upon the type of respiration apparatus used, could vitiate the results considerably. In the closed-circuit respiration apparatus such gain or loss of air would be measured as a gain or loss of oxygen and hence would be destructive of the value of such apparatus. In the open-circuit apparatus the error from such a source would be practically negligible, for even if 10 c.c. of room air leaked into or out of the helmet per minute, the study of the respiratory quotient as such would be unaffected. Similarly, a leak would have to be of considerable magnitude to affect the measurement of the total metabolism in an open-circuit respiration apparatus. Practically, leaks need not, and do not, occur.

A second objection, a physiological one, is that the helmet does not measure the carbon dioxide given off from the entire body. This objection applies likewise to the face mask, the mouthpiece, and the inflatable nosepieces. The helmet at least includes the carbon dioxide given off from the skin of the face and the head, which has a fairly high skin temperature and a correspondingly greater skin activity. The degree to which skin respiration enters into the total respiration has been the subject of many studies, one of the most recent being that of Campbell[12]. It may be assumed that the carbon dioxide given off from the skin corresponds to approximately one per cent. of the total carbon dioxide coming from the lungs and skin[13]. Hence there is this physiological objection to the helmet. But this objection applies equally as well to all other forms of respiration apparatus except those that permit of the subject's being placed completely inside a large respiration chamber.

The third objection is seemingly a serious one. With the mouthpiece and the inflatable nosepieces used with inspiratory and expiratory valves the subject inhales air, usually outdoor air, normally containing 0.030 per cent. carbon dioxide. With the helmet valves may not be employed and it must be artificially ventilated. It is impracticable to ventilate it at such a rate that the carbon-dioxide content of the air will be held anywhere near 0.030 per cent. Pettenkofer and Voit[14], in their classic studies, were impressed with the belief that the ventilation of a respiration chamber must be excessively rapid. Hence the ventilation rate in their chamber was enormous and the carbon-dioxide percentage was correspondingly low. Similarly, Sondén and Tigerstedt[15] and their associates planned for excessive ventilation in their respiration chamber at Stockholm, and hence Sondén devised his extraordinarily delicate gas-analysis apparatus for carbon dioxide only[16], with which the percentage of carbon dioxide in an air sample (diluted to less than 1 per cent. carbon dioxide) can be determined to the third significant figure. In all respiration experiments since that time the carbon-dioxide content of the air inside the chamber has, by common consent, been permitted to be about one per cent. Metabolism measurements have been made by Benedict and Milner[17] with a man who remained for two successive days inside a respiration chamber, the air of which had a carbon-dioxide content of less than 0.03 per cent. during the first 24 hours and of 2 per cent. or over during the following 24 hours. The results obtained on these two days showed no appreciable difference in the metabolism, although the experiments were by no means made under conditions ideally controlled for purposes of comparison.

The question as to the effect upon metabolism of breathing air containing a high percentage of carbon dioxide has, singularly enough, never been raised seriously. Those who advocate the use of a mouth-breathing or nose-breathing appliance in studies of the respiratory exchange could object that all experiments made in a respiration chamber in which the subject would inhale air containing from 0.5 to 1 per cent. carbon-dioxide would be physiologically unsound, and that the respiratory quotient determined under these conditions would be incorrect. This general thesis has never been laid down as strongly as the writer has anticipated. Experiments are actually in progress in the Nutrition Laboratory to test this very point, and these show that variations in the carbon-dioxide content of the air in the helmet from about *0.2 up to 1.5 per cent. cause no significant alteration in the respiratory quotient or in the total metabolism.* In any event, the helmet embodies the principle of using an atmosphere containing about 1 per cent. carbon-dioxide, long established for all respiration chambers and respiration calorimeters, both for humans and for animals.

USE OF THE HELMET IN A CLOSED-CIRCUIT APPARATUS DURING SEVERE MUSCULAR WORK

A tight closure of the rubber diaphragm about the neck might be expected under the conditions of the ordinary rest experiment. Is the closure sufficiently tight to make experiments during muscular work practicable? The helmet can be

used in muscular work experiments in which the movements of the head are not excessive. Thus, if the position of the torso is reasonably well fixed and the work is done either with the hands* (as in pulling an ergostat) or with the legs (as in riding a stationary bicycle ergometer), the helmet may well be employed. In such experiments, since the increased ventilation of the lungs will cause rapid and deep movements of the spirometer bell, two tubes are used to connect the helmet with the spirometer so that the subject may breathe even more freely.

The helmet, with celluloid window, metal tube, baffle plate, and chains for suspension, but without connecting rubber tubes, weighs 2 kg. When the subject is sitting, the helmet may be suspended at a suitable height so that no weight will have to be supported by the head. In certain muscular work experiments, which require vertical movement of the body, it has actually been found advantageous, however, to rest a small part of the weight of the helmet on the subject's head to assist in steadying it. For this purpose a rubber sponge is wired to the baffle plate, to make the contact between the helmet and the head more comfortable, and a piece of cheesecloth is placed on top of the head for hygienic purposes. The greater proportion of the weight of the helmet is supported by a fairly long spiral spring hanging from the ceiling. Thus the actual weight resting on the head is small and yet the head can move freely up and down without danger of leakage of air around the neck.

This type of suspension is particularly advantageous when the subject is riding the bicycle ergometer or walking on a treadmill, for during such work the position of the body remains essentially unchanged. In these cases, however, the oxygen consumption per minute is so large that graphic registration of the fall of the spirometer bell is hardly possible. It is true that with a spirometer having, for example, a capacity of nine liters, one could make due allowance in starting the tracing on the kymograph drum for the normal expansion and contraction of gas inside the bell during each respiration and still have leeway for recording an absorption possibly of four liters. This would represent the oxygen consumption for approximately two minutes of moderately severe work. Graphic record of the oxygen consumption during a short period of muscular work would thus be possible. It is more practical, however, to employ a well-calibrated, wet gas meter[18] and to replace the oxygen absorbed from the system by introducing more oxygen at such a rate as to keep the excursions of the spirometer pointer at the same level on the kymograph drum.

At the moment of writing an extended study of muscular exercise as affected by breathing oxygen-rich mixtures is in progress, using the helmet. The oxygen consumption during the muscular work was as high as 1500 c.c. per minute.

*Demonstrated at the Nutrition Laboratory during the XIIIth International Congress of Physiologists, August, 1929.

PRACTICAL USES OF THE HELMET*

The two methods described on page 155 for the measurement of both the carbon-dioxide production and the oxygen consumption were employed in a recent research on the influence of mental effort on metabolism[8], and it is clear that this apparatus can be used not only for studying the effect of mental processes but likewise for making observations on psychopathic patients, when they can coöperate. The helmet is easily and rapidly applied, there is clear vision, the subject is not completely encased in any type of respiration chamber, but is freely accessible to the operator, and hence the helmet should lend itself very well to the study of coöperative patients.

For patients simple forms of muscular exercise, such as the movement of chest weights and spring exercises, can also be used with the helmet by the technique described on pages 156 to 157. Thus the effect of such exercise (including the effect of the particular tempo of the exercise) upon metabolism can be directly determined with each patient.

The helmet likewise makes possible observations of the metabolism during sleep, for unlike the mouthpiece which cannot be held in the mouth with an air-tight closure during sleep, the tightness of closure of the helmet about the neck is not affected by any relaxation of the facial muscles. Similarly the helmet may be substituted for the mouthpiece in the case of non-coöperative children, since various sized helmets can easily be made.

In oxygen therapy the difficulty of supplying a patient with oxygen without great loss of the gas or without the use of a fairly large chamber or cumbersome apparatus has always been bothersome. The helmet makes it possible to place on the head of the patient a small chamber (closed circuit) with a comfortable collar and to furnish oxygen and remove carbon dioxide from the chamber at will, with a minimum expense for oxygen. Its practical adaptability is obvious. Maintenance of the oxygen in the air in the helmet at exactly 60 per cent. will involve checking from time to time of the oxygen content. From our own experience we find that when the helmet is once attached, a leak never occurs. One can quickly adjust the oxygen content to about 60 per cent. and after nitrogen equilibrium is established, there should be little change in the air in the system except that due to the slight accumulation of nitrogen in the oxygen supplied. The accumulation of nitrogen can be kept at a minimum by periodic release of gas from the system, followed by immediate replacement with fresh oxygen.

*The helmet and other parts of the respiration apparatus, including rotary air impeller, are manufactured by W. E. Collins, 555 Huntington Avenue, Boston, Mass.

The use of the helmet is being considered in preliminary studies of the administration of a mixture of 5 per cent. carbon dioxide and 95 per cent. oxygen, as recommended by Henderson and Haggard for resuscitation[19]. For this purpose a by-pass must be installed for the blower and other adjustments made, in order to absorb only the carbon dioxide produced by the subject and not alter the percentage of carbon dioxide in the gas to be inhaled. These illustrations are cited to show the general applicability of this form of respiratory device.

SUMMARY

A light-weight, head respiration chamber or helmet is described, which can be substituted for the face mask, mouthpiece, or nosepieces, and which is more comfortable and more quickly adjusted than are the other types of breathing appliance. The helmet may be employed both in closed and in open-circuit apparatus that are ventilated mechanically by a blower, but not in apparatus having inspiratory and expiratory valves. Details are given regarding its use during rest and during muscular work experiments. With this helmet the Nutrition Laboratory is investigating the influence upon metabolism of breathing air containing various percentages of carbon dioxide, the normality of respiration with the helmet as compared with other breathing appliances, the constancy in the basal respiratory quotient, and the relationship between the respiratory quotient and the mechanics of respiration. The possibilities of using the helmet in oxygen therapy and for resuscitation are cited as illustrations of the general applicability of this respiratory device in the hospital or clinic.

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WHY DO SO MANY DIE OF TUBERCULOSIS?*†

BY JAMES ALEXANDER MILLER, M.D.‡

THE steady decline in the tuberculosis death rate in the United States, which has been especially accelerated since the beginning of the anti-tuberculosis crusade and particularly since the War, has led to a widespread sentiment that the tuberculosis problem has been solved. From the statistics from certain special areas where all known methods of control of tuberculosis have been put into operation, it would appear that we have at our command the means of halving this mortality, if we were able to put into effect the means and knowledge at our disposal. Why do these 45,000 people die unnecessarily of a so-called preventable disease?

The two main causes are: first, the exposure of susceptible individuals to an overwhelming infection from those cases that already exist; and secondly, the breaking down of the normal resistance of individuals to slighter infections to which they would not succumb if it were not because of untoward conditions.

Public authorities, the general public, and the great body of practising physicians are all equally concerned in the responsibility for preventing these deaths. The prevention of massive infection is in the main accomplished by segregation of active cases in institutions out of contact with susceptible people, particularly children, and, secondly, by the protection of humans, particularly children, from transmission of tuberculosis from cattle, especially through milk, and third, the scrupulous care in segregated cases to protect susceptible contacts by methods of strict personal hygiene.

The tremendous advance in facilities for hospitalization, the control of milk-borne infections through pasteurization, and the general campaign of education and home supervision of active cases have already done much. These factors should be strengthened and extended and should have strong public support. The community as a whole, therefore, should urgently and consistently further the efforts of the public health officers to provide these safeguards.

In Massachusetts there has been an especially effective organization and the present administration of the Health Department is second to none of the states of the Union.

*Read before the New England Health Institute, April 10, 1930.

†An amplification of the digest that was published on page 1047, issue of May 29.

‡Miller—Professor of Clinical Medicine, Columbia University. For record and address of author see "This Week's Issue", page 182.

Public authorities, however, can by no means accomplish all, efficient though they may be. Further responsibility of the layman is real and can only be appreciated by continued enlightenment and education in public health and preventive methods.

Until there is a generally accepted sentiment that the excretions from the respiratory tract, whether by coughing or sneezing, are potential sources of disease, we shall not get very far in the control of respiratory illnesses, whether acute or chronic. We have made great progress in the sense of decency in regard to expectoration in public places, but there is still much to be done to protect contacts by the proper control of cough and expectoration due to whatever cause, particularly in closed spaces such as homes and places of work.

The second important additional responsibility of the layman has to do with the difficulties of early diagnosis. Pulmonary tuberculosis particularly is a very insidious disease in its onset. Only by an aroused intelligence will it come about that cases with early tuberculosis will feel that their particular ailments are of sufficient importance to seek medical advice while they are still in the early stage.

Moreover, after the diagnosis has finally been made in an early stage, there are tremendous personal and economic obstacles placed in the way of making the necessary sacrifices to secure adequate treatment. Laymen must be educated to the point of accepting this fact before cases of pulmonary tuberculosis can be expected to get well, for with all our talk about the curability of tuberculosis we know that after a person gets to a moderately advanced or far advanced stage of the disease, cure is almost impossible.

It is a very striking fact that in the sanatoria which are primarily designed to take care of only early cases, not more than one-third of the cases in such institutions are actually in the early stage, which means that most cases which come to treatment are already beyond what we may generally accept to be a curable condition.

Now, if it is true of the general public, it is much more true of the physicians, for they are supposed not only to be intelligent but also to be especially educated and to be aware of all of these facts without any further special education, and yet, what do we see? In spite of the fact that many cases do not consult physicians until they are beyond the early stage, there are still thousands of others who do so and then are not competently advised.

If one makes the rounds of any sanatorium and talks intimately with the patients he will be astounded to find in how many cases the story is the same, that they had consulted one, two, three, four or half a dozen physicians over a period of months before the correct diagnosis was established. The medical profession thus shares the responsibility for the fact that so few early cases are put under adequate treatment at a time when they may be cured.

It is difficult completely to analyze the reason for this. The insidious nature of the disease and its manifold ways of showing itself is the most probable explanation, but this is really not an adequate excuse for a trained physician. In spite of the widespread campaign of education and the better training of physicians in recent years, it is still astonishing that tuberculosis does not seem to take its proper place in the minds of many physicians as a possible explanation of obscure symptoms. Eternal suspicion that an obscure ailment may be due to tuberculosis is the only adequate safeguard for the physician. Once this suspicion is aroused, the difficulties in diagnosis should not in these days be sufficient in the great majority of cases to prevent a correct diagnosis.

If only one single precaution were taken in suspicious cases, that is, to have an x-ray of the chest taken, it would save a large proportion of the mistakes now made.

If less reliance was put upon sputum examinations and less upon fine points of physical diagnosis of the chest and more on the story of the patient as a whole and on the x-ray examination, it is certain that great progress would be made.

Certain it is that at the present time so many mistakes are being made that a more intelligent public is now aroused far too often by what appears to be the inefficiency or incompetency of medical men.

If, therefore:

1. A community could be protected by adequate hospitals and sanatoria to which patients would be willing to go
2. If the milk supply should be adequately safeguarded by pasteurization
3. If patients with tuberculosis or with a cough from any cause were always scrupulously careful as to the protection from infection of those about them
4. If the general public could be made to realize that tuberculosis is still a very frequent disease and come to know some of the earmarks by which it manifests itself and seek earlier medical advice, and if, finally
5. Medical men would sharpen their faculties so that they would suspect cases early and make correct diagnoses in those in whom it may already be suspected;

by these simple methods alone, the number of active cases in the community could be cut in half.

THROMBOSIS OF THE INTERLOBULAR ARTERIES OF THE KIDNEYS IN PREGNANCY

BY SIDNEY C. DALRYMPLE, M.D.*

BILATERAL cortical necrosis, resulting from infarction of the cortical or interlobular arteries and occurring postpartum in cases of toxemia of pregnancy, is rare.

The following case, with the necropsy findings, is an example typical of the cases heretofore reported:

CASE REPORT

Mrs. C., aged 30, primipara, entered the hospital at term for bleeding placenta previa. Except for hyperemesis in the early months, her pregnancy had been uneventful. There was a slight elevation of the systolic blood pressure, which had ranged between 135 and 150. Physical examination upon entrance showed a pale woman, with slight pitting edema of the extremities and moderate bleeding. Before operation could be begun, she went into shock and her blood pressure fell to 108. Within an hour Cesarean section was performed, a dead foetus extracted, and 650 c.c. of whole blood transfused.

Four hours after operation the patient had a convulsion lasting 20 minutes, characterized by general twitching and clonic movements. At four-hour intervals two more convulsions occurred. The only urine obtained was the preoperative catheterized specimen. After the operation there was complete anuria, which lasted till the patient's death, 11 days after operation.

Examination of the catheterized specimen showed a heavy trace of albumin. The day after operation the patient's N.P.N. was 60 mgms. per 100 c.c. of blood. Two days later the N.P.N. was 86 mgms. and B.U.N. 43 mgms. Two days later the N.P.N. was 150 mgms. and the B.U.N. 100 mgms. The day before death the N.P.N. was 300 mgms. and the B.U.N. 132 mgms.

The only additional symptom and physical change which developed was drowsiness and moderate generalized edema.

The necropsy showed the major pathology to be in the kidneys. The right weighed 225 grams and the left 220 grams. These weights were considered within the normal for the patient who weighed 200 pounds. The cortical surface was grayish-white in color and was mottled with reddish-brown spots, 4 to 5 mm. in diameter. On section the greater portion of the cortex and the columns of Bertin were almost pure white in color. The medullary substance was dark red with fine hemorrhagic lines at the point of demarcation. The cortex measured 5 mm. in thickness. The renal arteries and veins were negative.

Microscopically the kidneys showed uniform coagulation necrosis of the outer two-thirds of the cortex with the exception of a slight rim of uninvolved cortical tissue situated just beneath the capsule. The necrotic zone showed loss of staining of all cells, without, however, loss of cell outline. There was no evidence of any preëxisting pathological lesion. The interlobular arteries were thrombosed, the thrombosis most marked and uniform just after leaving the arterial arches. The thrombi consisted, for the most part, of old fibrin with some few red cells enmeshed in the more distal portions of the arteries. The vessel walls, while involved in the necrotic process, showed no evidence of preëxisting injury. The walls of a few vessels which lay nearest the living cortical tissue were invaded with polymorphonuclear and endothelial leukocytes. Rarely one of these vessels showed early organization of the thrombus. In the living cortical tissue adjacent to the necrosis the capillaries showed congestion and there were areas of perivascular hemorrhage. A cellular reaction, which consisted of neutrophiles and mononuclear cells, extended out into the necrotic tissue for a short distance.

In this living cortical tissue there was evidence of acute nephritis. Numerous plugs of leukocytes and fibrin were found in the capillaries of the glomeruli. The capsular epithelium showed some fibrinous exudate and there were a few crescents formed by proliferating epithelium. The tubules showed albuminous and colloid degeneration of the epithelium and some desquamation of the lining cells. The lumen of the tubules showed collections of serum, hyaline-like material, masses of colloid droplets, and occasionally a clump of red cells.

The stroma was edematous and a few small foci of lymphocytes were encountered. The veins throughout the cortex were either collapsed or filled with normal appearing red cells.

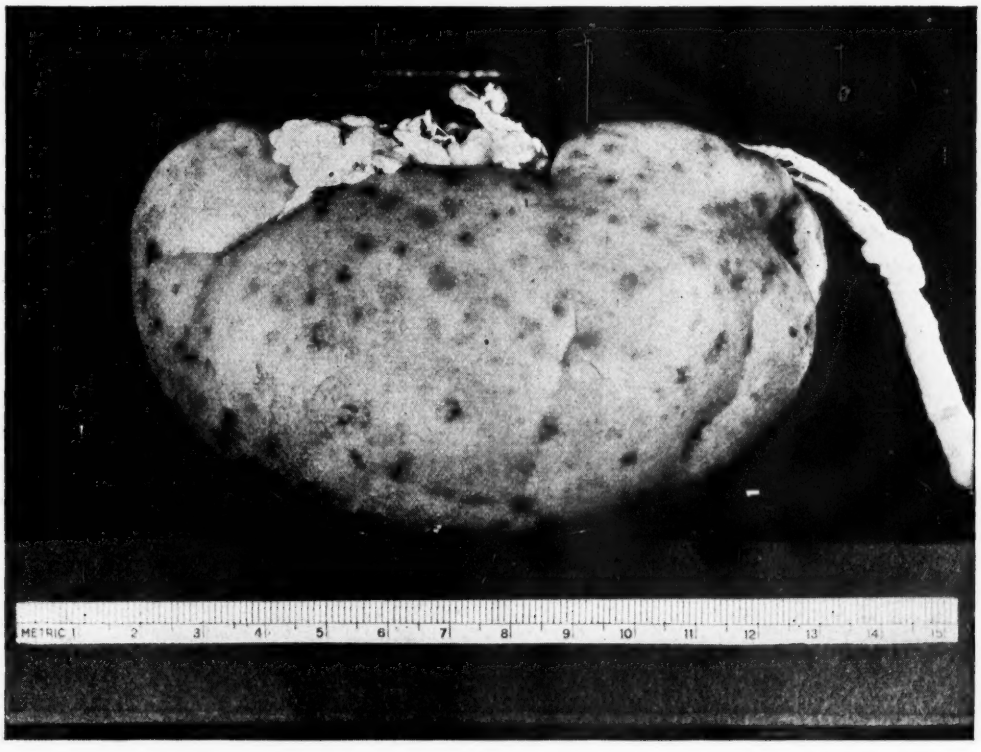
The anatomical cause of death was infarction of the interlobular arteries of both kidneys with cortical necrosis.

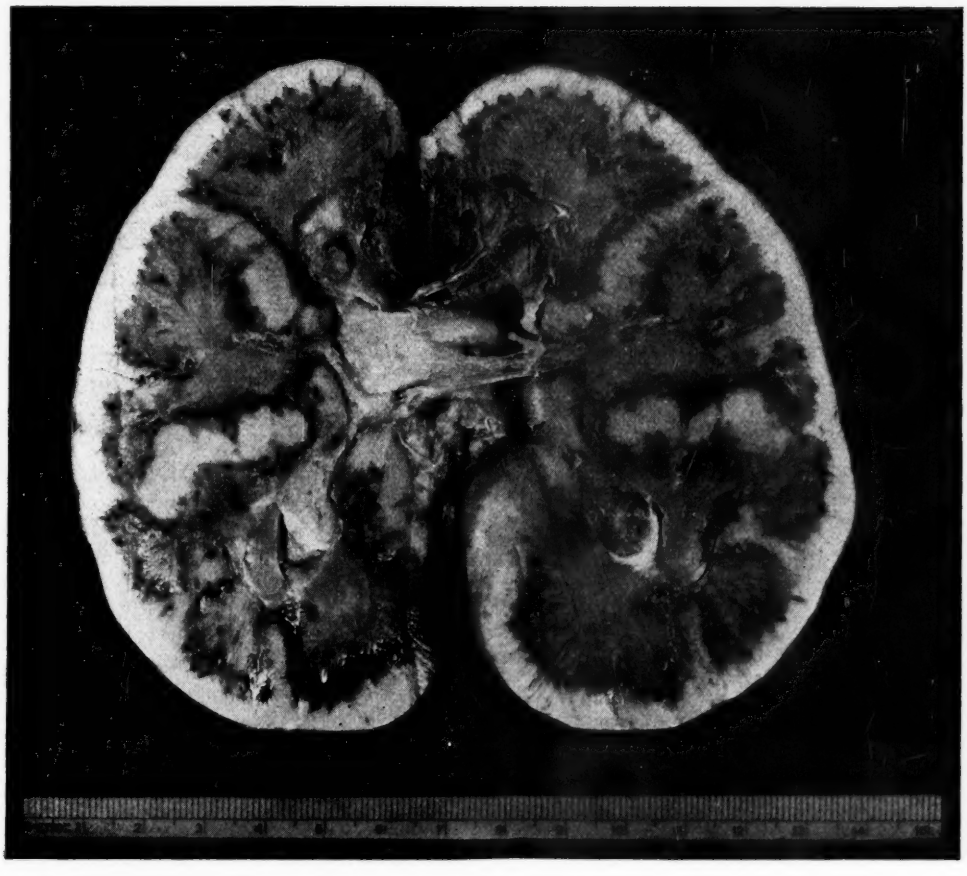
It is interesting to note that in the cortical areas of necrosis there was no evidence of a preëxisting lesion, either of the parenchymatous tissue or the blood vessels. It is obvious, then, that the lesions found in the living tissue occurred after, rather than before, the thrombosis.

The literature contains eleven similar cases. In all there were symptoms of toxemia. In none were any lesions of an eclamptic type found in the liver and in all cortical necrosis with thrombosis of the interlobular arteries was found. Three other similar cases of cortical necrosis have been reported except that in one the thrombosis involved both arteries and veins. A second showed thrombosis of the renal vein from which streptococci were recovered. The third case showed thrombosis of the renal and ovarian veins. (1 to 12 inclusive.)

The following theories have been advanced as to the cause of the thrombosis. Bradford and Loris[1] suggest a preëxisting endarteritis of the renal arteries. Lloyd[3] thinks that an agglutinin acts upon the red cells in the interlobular arteries. Klotz[4] concludes that dissolution of the red cells precipitates the formation of the thrombus. Jardine and Teacher[5] believe that spasmodic contraction of the renal vessels is probably the ultimate cause. Jardine and Kennedy[7] state that they consider the thrombosis secondary to the necrosis. Glynn and Briggs[9] suggest that a toxin allied to the eclamptic toxin injures the vascular endothelium, causing a deposition of platelets. Carson, W. J. and Rockwood[11] give as their opinion that there is an acute glomerulo-

*Dalrymple—Instructor in Pathology, Boston University School of Medicine. For record and address of author see "This Week's Issue", page 182.





Kidney from the case of Mrs. C. showing cortical thrombosis from infarction of the interlobular arteries.

nephritis with injury to the vascular endothelium from a toxin circulation in the blood stream.

A few of these theories are contradictory. Others presuppose the presence of an unknown toxin. Klotz[4] says: "It is evident that in these cases the part involved was not a mere chance selection, but that most probably the function of the organ and the relation of the blood supply to the secreting apparatus played an important rôle."

Richards[14] has shown that urine formation is dependent upon intrarenal blood pressure and not upon rate of flow. Postoperative drop in blood pressure with temporary anuria is not an uncommon finding. We have had one case in which the anuria persisted till death, four days later, without any renal change occurring. It seems probable that this mechanism, together with the increased coagulability of the blood of pregnant women, as shown by the increased fibrinogen content and the rise in platelets, is sufficient to cause infarction in a rare case.

What action, if any, histamin, toxin, or chemical change plays in suddenly reducing the blood pressure in the kidney in these cases is undetermined. The actual mechanism of the change is also unknown.

It is suggested that a possible prophylactic measure would be the plasmapheresis of Irving and Taylor[13], which would aid in the removal of hypothetical toxin and produce gradual reduction of the blood pressure.

I am indebted to Dr. Nathaniel P. Brackett for allowing me to report his case and to Dr. George C. Prather for assistance with the bibliography.

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NEUROLOGICAL COMPLICATIONS OF WHOOPING COUGH

A Review of the Literature and Report of Four Cases*

BY R. CANNON ELEY, M.D.†

THE purpose of this paper is to call attention to the neurological conditions which may follow whooping cough, to review briefly the literature pertaining to this phase of the disease, and to report four cases.

A classification of these various disturbances is in itself quite a difficult task, for one may readily see how one group will overlap another, yet for purposes of convenience we will accept the following classification in order that we may not too easily become confused:

1.) Convulsions occurring during the course of the disease
2.) Epilepsy
3.) Mental retardation
4.) Spastic paralysis
5.) Myelitis
6.) Visual disturbances, temporary and permanent

*From the Medical Department of the Infants' and Children's Hospital and the Department of Pediatrics of the Harvard Medical School, Boston.

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†Eley—Medical Resident, Neurological Service, Infants' and Children's Hospital. For record and address of author see "This Week's Issue", page 182.

Group 1. Convulsions occurring during the course of the disease:

Convulsions occurring during its course have been noted since the earliest recognition of whooping cough and have always been considered as an unfavorable prognostic sign. Valentine[1] reviewed the records of eighty-three patients with pertussis, sixty-four of whom had convulsions during their illness, and of these sixty-four cases, fourteen died, twenty-two developed spastic paralysis, and twenty-eight showed some residual neurological disturbance. This was further emphasized in 1920 by Reiche[2].

Until recently it was practically accepted as a universal truth that these convulsions were due to various degrees of intracranial hemorrhage, the severity of which was determined by the subsequent clinical course of the patient. This theory originated during that period of medicine when post-mortem examinations were only occasionally made, and the conclusions were drawn from a very few cases. Hockenbach[3] collected twenty-three cases in which a clinical diagnosis of brain hemorrhage had been made. In this group there had been nine post-

mortem examinations, which showed five cases with hemorrhage into the gray matter, two with hemorrhage into the cortex, and two with hemorrhage between the pons and dura. However, only the gross findings are recorded and apparently microscopic examinations were not undertaken. Schreiber[4] in 1899 reviewed thirty-eight cases with eleven deaths. Autopsies performed in ten of the eleven cases showed minute hemorrhages in various parts of the brain which, however, the author felt were not sufficient to explain either the clinical course or the cause of death, and he offered the suggestion that if thorough microscopic examinations were made, a more diffuse cellular change would be found, and probably of a hemorrhagic or encephalitic nature. In 1900 Hockinjos[5] studied forty-two cases in which a diagnosis of intracranial hemorrhage had been made from the clinical course of the disease. In a few cases post-mortem examinations had been performed and although hemorrhages had been found, they were usually of a minute type; he concluded that the evidence that convulsions were due to hemorrhage was both insufficient and inadequate. Vidal[6], Bloche[7], Simoninis[8], Luce[9] and West[10] have reported cases which at autopsy have shown not only minute hemorrhages in the brain but also edema and cellular degeneration.

In 1904 Neurath[11] demonstrated early meningeal changes in fatal cases of whooping cough, and although several authors had suggested that hemorrhage was probably not the chief cause of convulsions, palsies, etc., yet these were the first data offered to disprove definitely the previously accepted theory. From these studies Neurath concluded that there occurred a diffuse inflammatory reaction through the brain, which was probably of toxic origin. In 1905 Rhein[12] reported a case of a twenty-one months old baby who, following whooping cough at three months of age, gradually become spastic, deteriorated mentally, had innumerable convulsions, and finally died. Autopsy examination showed regressive changes in the cortical cells and a diffuse proliferation of neuroglia. The author considered his case quite similar to the one described by Neurath in 1904 but attributed the changes to multiple minute hemorrhages. In 1919 Canelli[13] made post-mortem examinations of two infants, six and twenty-three months old, who died in coma during whooping cough. No histological lesions were found in the vessels or brain, but it was thought that minute hemorrhages had occurred due to the action of carbon dioxide on the vessels during asphyxia with paroxysmal coughing, or resulting from increased intracranial pressure produced by the cough.

In 1924 Husler and Spatz[14] described a typical regressive change in the nerve cells of the cortex with not only loss of staining properties but also of all structures of the cell except the nucleus. They reported two cases, one dying three days after the onset of convulsions, and the other three weeks after the onset, from a terminal pneumonia. Autopsy examination showed no hemorrhage; microscopic examination of the cortex, dentate nucleus, and corpus striatum revealed irreversible cellular changes with unquestionable death of the cells and proliferation of neuroglia. This observation has added a new impetus to the study of whooping cough and is undoubtedly one of the greatest contributions to the satisfactory explanation of the neurological conditions seen following this disease.

During the following year (1928) Jochims[15] confirmed their studies and suggested the term "whooping cough encephalopathy." At the same time Neuberger[16] and Singer described similar pathological changes but thought that they were the result of air emboli, occurring secondary to a ruptured alveolus, following paroxysmal coughing, an observation which has not been confirmed. Berardi[17] and Sakanchi[18], in 1928, described changes similar to those observed by Husler and Spatz. Ford[19] has depicted the post-mortem observations in two cases, both of which showed flattening of the convolutions, disappearance of sulci, edema, universal atrophy of cortical cells, proliferation of neuroglia, and slight dilatation of the ventricles. Askin and Zimmerman[20] recently reported the autopsy observations on a child dying from pertussis after four weeks of illness. The gross specimen showed a subarachnoid hemorrhage at the base of the brain, surrounding the left internal carotid artery, which was considered to be due to a torn pial vessel; microscopic sections showed diffusely scattered focal collections of small deeply staining mononuclear cells but without a true perivascular "collar" collection. Singer[21], in 1929, reported six cases which showed a diffuse hemorrhagic encephalitis. In fact, he differentiates whooping-cough encephalitis from epidemic, or toxic, encephalitis by the marked tendency towards microscopic hemorrhages.

Therefore, in view of the more recent work, it would appear that the time-honored theory of hemorrhage being the only cause of convulsions must be abandoned. However, realizing that convulsions are of prognostic importance, one should always exclude other etiological factors which may precipitate these neurological manifestations. I have special references to the work of Bluhdorn[22] in 1905 and of Powers[23], in 1925, both of whom reported cases of whooping cough in which the convulsions were proved to be due to a low blood calcium, and readily subsided following proper therapy. However, there is no doubt that hemorrhages may, and do occur, as shown in a case discussed by Cabot[24] and in Case I of this communication.

CASE I. E. C., a white female patient 8 1/12 years old, was admitted to the Children's Hospital on ac-

count of repeated convulsive attacks of 3 months' duration. The family history was unimportant until she was 5½ years old, at which time she had an unusually severe attack of whooping cough. She has had no other infectious or contagious diseases. Three months prior to admission the patient dropped her fork while at the table and when she reached to the floor to recover it, her right arm became rigid and spastic. This condition, however, lasted only a few minutes and little attention was given to it. During the following month, she began to have frequent convulsive attacks localized to this arm. One month before admission the patient began to have generalized convulsions, which, however, were always more pronounced on the right side.

Physical examination was absolutely negative. Tuberculin tests (introdermally) and Wassermann tests were negative. Encephalograms showed normal ventricles, but there were two irregular lobulated calcified masses adjacent to each other just medial and slightly above the posterior portion of the left posterior horn, and a small calcified mass in the left inferior parietal region just inside the vault. As no evidence of tuberculosis was present, and as the configuration of the ventricles was not distorted, it was concluded that these masses were calcified hemorrhages, although we realize that we do not have irrefutable evidence. Operative procedures were entertained, but as the patient has had no further convulsions over a period of 5 months and as there is no evidence of increased intracranial pressure, they have been postponed.

CASE I. Demonstrating calcified areas.

Group 2. Epilepsy:

It appears that the next logical group of patients to consider would be that large series classed under the term of epilepsy, especially so if we are to consider this term as applying to those patients who have convulsions for which no definite pathology can be demonstrated. That epilepsy may follow whooping cough, there appears to be little doubt, as cases have been reported by Theodor[25], Steffen[26] and others. However, in attempting to explain the mechanism of this type of convulsion following whooping cough, one must not only theorize but also draw analogies, which, in view of the pathology that we now know may exist, appears permissible.

Fay[27] has called attention to the disturbed circulation and absorption of cerebrospinal fluid in the subarachnoid spaces of the brain in cases of epilepsy; Cobb and Lennox[28], and especially McQuarrie[29], have stressed the importance of water balance in the treatment of epilepsy, and recently Pancoast and Fay[30] have demonstrated by encephalography the local collections of large amounts of cerebrospinal fluid in the subarachnoid spaces of the brain in patients suffering with convulsions following trauma.

When we consider the diffuse inflammatory reaction which occurs in the brain in whooping cough, it appears logical to assume that some of the normal channels for the flow of the cerebrospinal fluid may easily become obliterated, resulting not only in disturbed amounts, which may cause either pressure or atrophy, either of which may later produce convulsions. I am by no means offering this theory as a cause of epilepsy but merely suggesting that in those few cases in which idiopathic convulsions appear following whooping cough, some such condition may exist.

Group 3. Mental retardation:
Group 4. Spastic paralysis:

Groups 3 and 4 are so interrelated that it is probably best to discuss them together. However, the old theory of hemorrhage must be partially replaced by that of Husler and Spatz if we are to understand fully the underlying pathology resulting in mental retardation and spastic paralysis. That hemorrhage per se may unquestionably produce these conditions has been clearly shown by Crothers[31], Ford[32] and others, both in cases of intracranial hemorrhage following trauma at birth, and in cases of hemorrhagic

disease of the newly-born. Ford has shown at autopsy definite cerebral atrophy following whooping cough and by means of encephalography Crothers[33] has been able to demonstrate, during life, cerebral atrophy following intracranial hemorrhage, encephalitis, whooping cough and other conditions.

Since the underlying pathology is essentially the same both in whooping cough encephalopathy and in encephalitis, whether of the epidemic or "toxic" type, it is no longer a difficult task to explain either the development of paralysis, be it flaccid or spastic, or of mental retardation. Crothers has clearly shown by encephalography that these disturbances are due to widespread cerebral atrophy similar to that seen after any acute inflammatory or toxic process of the brain. Cases II and III are typical examples of this group.

CASE II. E. B., a white female child 4½ years old, was admitted to the Children's Hospital on account of convulsions. The family history was unimportant. When the patient was 1 year of age, she had a severe attack of whooping cough and during an attack of paroxysmal coughing she suddenly had a convulsion, which lasted for several hours. Lumbar punctures performed at this time gave repeated blood-tinged fluid, which was thought to be due to intracranial hemorrhage rather than to trauma. These convulsive attacks occurred at frequent intervals for the next few days, during which time the patient developed an opisthotonic position with generalized muscular spasticity. This condition persisted for the following 3 months; during this period the patient received massage at regular intervals. At the end of a year she was able to move her right arm and leg but has never been able to move the left side. Prior to the onset of her illness the patient had been considered mentally normal, but since her illness she has obviously been mentally retarded.

Physical examination showed a fairly well developed and nourished white female child, lying with her left arm and leg hyperextended and spastic. The right arm and leg showed slight spasticity but no deformities; she would notice neither objects nor sound, although she was not blind or deaf. The remainder of the examination was not important.

Air was injected into the ventricles by the spinal subarachnoid route. Roentgenograms showed enormously dilated but symmetrical ventricles, which we have interpreted as indicating cortical atrophy with compensatory dilatation.

CASE III. C. V., a white female patient 19 months old, was admitted to the Children's Hospital on account of inability to move her left arm, left leg, and right arm. The family history was irrelevant. At the age of 1 month the patient contracted whooping cough from her brother, and during the course of the disease developed a bilateral internal strabismus, which has persisted throughout life. However, it was thought that she had made an uncomplicated recovery and aside from the strabismus, she had enjoyed good health until the present illness.

The present illness dates from 1 month prior to her admission, at which time she became drowsy, vomited several times, refused her food and became unable to use her left arm, left leg, and right arm. About 3 days later the patient regained partial use of these members but has not recognized her parents since the onset of the illness and has remained in a semi-stuporous condition.

Respirations were regular and even and there was no cyanosis or muscular twitchings. Further examinations revealed bilateral internal strabismus, partial flaccid paralysis of the left arm, left leg and right arm, and absent knee jerks. Dr. E. B. Dunphy's report of the eyegrounds is as follows: "Right eye shows a large area of old choroiditis temporarily to the disc involving macular region. The disc shows some haziness on nasal side, the vessels are about normal. Left eye shows sharply circumscribed patch of old choroiditis nasal to disc; the disc is definitely blurred and the vessels are engorged. Cannot tell accurately about elevation. Child has a definite internal strabismus. This is probably dependent on the macular involvement of the right eye and dates back to the whooping cough, when the choroiditis probably occurred."

The blood examinations, Wassermann, tuberculins and urinalysis were negative. Air was injected into the ventricles by the spinal subarachnoid route and roentgenograms revealed large dilated asymmetrical ventricles.

CASE II. Demonstrating dilated and symmetrical ventricles.

None of the patients with cerebral atrophy following pertussis that have been under our observation have died, and therefore we have been unable to confirm our roentgenological observations by post-mortem examination. However, the description of the gross appearance of the

brain in one of the cases cited by Ford supports our findings.

Group 5. Myelitis:

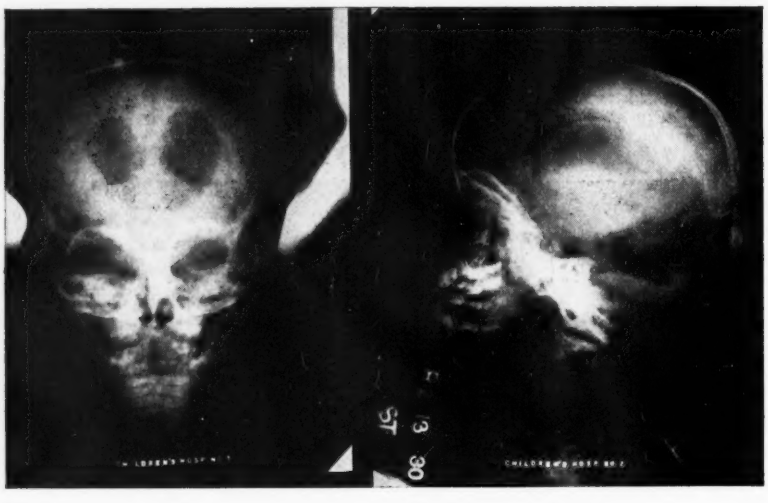
Mackey[34] has described a case of Landry's paralysis with complete recovery which simulates the case reported by Moebius. The former's patient was a child three years old, who developed a typical ascending paralysis involving the lower extremities, upper extremities, diaphragm and neck muscles, in the order named, followed by complete recovery. The author concludes that this is a peripheral neuritis similar to that seen in post-diphtheritic paralysis. I am unable to concur with this opinion, for the present tendency is to consider an ascending paralysis of this nature as a true ascending myelitis similar to that seen in acute anterior poliomyelitis. Furthermore, in diphtheria the paralysis is the result of the action of the toxin liberated by the organism and is not the direct result of an acute inflammatory process, which we know now occurs in whooping cough. However, a distinction between acute myelitis and ascending myelitis must be kept clearly in mind.

In view of the diffuse inflammatory involvement of the central nervous system, it would appear reasonable to assume that an ascending form of myelitis, as well as a transverse myelitis might occur, although the literature does not contain any reported cases. In the cases described by Ford, Askin and Zimmerman no changes in the cord were noted.

Group 6. Visual disturbances, temporary and permanent:

In 1928 Litvak[35] reviewed the literature concerning this phase of the disease and collected seventeen cases. Of this group two patients were permanently blind, thirteen had transitory blindness and in two cases the ultimate results were unknown. Examination of the eyes showed the pupils to be reactive in seven cases, bilaterally dilated and non-reactive in ten cases: eight patients showed optic neuritis, one had choked disc, one had optic atrophy, one had ischemic fundi and in six cases the fundi were negative. Two of his patients showed spastic paraplegia. The author attributed these disturbances to the following factors: (1) hemorrhage into the posterior limb of the internal capsule, (2) encephalitis, (3) multiple hemorrhages into the retina and (4) toxicity.

During the past two years we have had two patients under our observation who have shown visual disturbances following whooping cough. In one case the disturbance was first noted when the patient was allowed out of bed, while in the second case the condition had not been recognized until the time of her admission to the hospital.



CASE III. Demonstrating dilated and asymmetrical ventricles.

CASE IV. E. B., a white male child 6 years old, was brought to the Children's Hospital on account of imperfect vision in the right eye. The family history was irrelevant. The baby was born at full term, normal delivery, the birth weight being 9½ pounds. No cyanosis, convulsions, or muscular twitchings followed delivery. The patient was never breast-fed but was given an adequate formula on which he gained and did quite well. Cod liver oil and orange juice were given throughout infancy. The child's development was normal. Aside from whooping cough, the patient has had no acute infectious or contagious diseases. When 2 years old the child had a severe attack of pertussis and, during the course of the disease, developed a left internal strabismus, which, however, was not considered to be of any importance. With the subsidence of the clinical symptoms of the infection the patient was allowed out of bed and at this time the parents noticed that while walking or playing he would frequently strike objects to the right of him. Six months later an examination of the eyes was made and glasses prescribed which corrected the strabismus and improved his vision. When 6 years old he was seen by another physician and referred to this hospital for further examination.

Physical examination showed a well developed and nourished white male child, who was mentally alert and quite coöperative. The examination was essentially negative except for his eyes. He was seen by Dr. E. B. Dunphy, whose report is as follows: "Right eye: the macular area has been destroyed by a large area of old choroiditis; probably not much of any sight is left; the disc is normal. Left eye; impossible to see the macula clearly due to constant motion of eyes. I rather suspect a minute lesion in this area which prevents central fixation and has led to the development of a nystagmus. Impossible to get accurate fields. The disc is normal. I believe the loss of fixation rather than hemianopsia is the cause of poor vision, which probably dates from whooping cough or some other acute infection in the past." In view of the history of strabismus developing during the course of the disease and the fact that the child has had no other known illness, it appears that these changes may be attributed to whooping cough.

The second case is the case previously described, that is Case III, which demonstrates both cerebral atrophy and visual disturbances.

COMMENT

During the course of any acute infection the tendency is to consider the central nervous system as an isolated entity not subject to changes occurring elsewhere in the body. The recent literature on pertussis clearly shows this to be an erroneous view, and should a thorough examination of this system be made during the course of any acute infection, I have no doubt that definite pathological changes would be found.

CONCLUSIONS

1.) Convulsions occurring during the course of whooping cough are of prognostic importance.
2.) Although hemorrhage may be a cause of convulsions, palsies, etc., yet in view of the more recent studies, we must consider that in the majority of cases they are probably due to a diffuse inflammatory process, resulting in irreversible cellular degeneration and atrophy of cerebral tissue.
3.) The central nervous system may be involved in any acute systemic infection and is not an isolated immune organ.
4.) Four cases from the Children's Hospital demonstrating neurological complications of whooping cough are presented.

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THE COST OF MAINTAINING THE NEW YORK CITY DEPARTMENT OF HEALTH

The actual per capita cost of the New York City Department of Health during the past three years was—

1927—90 cents per capita
1928—88 cents per capita
1929—60 cents per capita

During 1930 the cost will be about 65 cents per capita, for as against the approximate estimated expenditures of the Department of Health for 1930, namely, $5,122,000, the receipts of the Department for the first six months already total over $300,000.

On a visit to this city some months ago, an English health officer of one of the London districts stated that the expenditures of his department amounted to about 12 shillings per capita. This is nearly $3.00, a figure more than four times that spent by the New York City Department of Health. In view of the results already obtained, and bearing in mind that public health is purchasable, a substantial increase in the per capita expenditure on the work of the Department of Health would be to the best interests of the community. A considerable addition to the staff of medical inspectors and nurses, more food and sanitary inspectors, an increase in neighborhood health centers, extension of laboratory facilities, and of serological, clinical and x-ray assistance to private physicians, a further development of the Department's educational work, the organization of training courses for medical inspectors, nurses, food and sanitary inspectors—these are some of the activities for which additional funds are urgently needed. A net annual expenditure of $7,000,000, which would be only $1.00 per capita, would make all of these things possible and would undoubtedly yield handsome returns in the form of decreased sickness and death.—*Bulletin New York City Department of Health.*

CHILDREN'S TUBERCULOSIS PROGRAM IN MASSACHUSETTS*

BY PAUL WAKEFIELD, M.D.†

THE Chadwick Clinics began in the Fall of 1924 as the "Ten Year Program" and was one of the earliest attempts made in the United States to find the glandular type of tuberculosis in children. In attacking the problem of hilum gland tuberculosis in children it attempted to prevent so far as possible pulmonary tuberculosis in the children of Massachusetts. We are now in the sixth year of this work and the development of our method of work; the things that we have learned on the Clinic are most interesting and worth reviewing for you.

As many of you may know, the Clinic started as an "Underweight" clinic and we examined only the underweight children at first, but very soon we found that about 40% of hilum infections were in children of normal weight and overweight. Our procedure was then changed and the examination given to all children whose parents would give consent for the work. The Clinic has functioned in this way, examining all children up to the senior high school grade, until this year.

From the beginning we have had a desire to reach the older adolescent boys and girls in the senior high schools but there were two problems that limited our activities. In the first place, the demand for the Clinics has grown with each year of the work and the percentage of consents has increased from the neighborhood of 60% in the earlier years to 90% which was reached in some cases last year. Further, the children's parents came in such large numbers that our work was greatly slowed up and while it was a wonderful opportunity to talk over with each parent the physical condition of the child, we reached a point where it became clear we would be unable to cover the State in reasonable time if we gave so much attention to every child that came in for the examination. The second problem with the high school students is the problem of gaining their interest and coöperation. With the younger children, the parent decides what should be done but with the high school pupil, it is the child who virtually always decides what shall be done. Unless some method could be worked out that would gain their interest and appeal to the high school boy or girl, it is a waste of effort to attempt such a Clinic as ours for this group. In the beginning of this school year—September 1929—a new method of conducting the Clinic was adopted. For some time Dr. Chadwick had been considering the matter and a year ago we decided that we would change our method of work in order to concentrate, first, upon the tuberculous child and not do physicals on all of the children and in the second place to make an attempt to get the interest and coöperation of the high school group.

Briefly, our method of work for this past year is to have the requests for the examination sent home by the school teachers and collected by them when they are signed. These are then arranged according to the geography of the town or city and the personnel of our staff. The first thing that is done is to give a von Pirquet Test. These tests are given on Thursdays and Fridays and the arms are read on the following Mondays and Tuesdays. This gives a satisfactory interval for the development of reaction. On Mondays and Tuesdays we have two x-ray men who set up their portable outfits in centrally located schools and the doctors, when they read the arms, send the positive reactors at once to the x-ray man and the x-rays are taken as soon as the arms are read. One x-ray man remains with the group for Wednesday and clears up all absentees and retakes any questionable films. Every child that is tested has his arm read and an x-ray taken if a positive reaction is obtained. If the child is not at school, the doctor goes to his house to read the arm. Then, if the arm is positive and it is at all possible to bring the child to the x-ray man, the child is put into a car and brought to the school where the x-ray man is working and the x-ray is then taken. There are very few children given the test that are not carried clear through. We only miss those who develop some infectious disease or who leave town and are not possible to reach. We lose only about .004% of the children who originally are tested in this way. Occasionally, we find a parent who changes his mind after the test is given and objects to further work on our part. These cases, however, are very rare.

We have two nurses on the Clinic who do our advance work. One of these advance workers stays with the Clinic that she has prepared in a town, arranges the schedule from day to day, and helps in the work of the Clinic. The other advance worker goes into the next town or group of towns where we are going to work and assists the school teachers and nurses in getting the consents together and arranging them in groups for our work. These advance workers also make arrangements for my talks to the medical associations, the teachers, and the high school pupils. In some towns I am repeatedly called

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†Wakefield—Director of the Chadwick Clinics. For record and address of author see "This Week's Issue", page 182.

into Parent-Teachers' Associations to talk over with the parents the problems of their children's health.

To meet the problem of reaching the high schools, I have taken upon myself the task of attempting an educational program. In every town where we work I strive to speak first to the doctors of the town making it clear to them that our work is entirely diagnostic and that the care of the children and the success of the Clinic depends upon their coöperation and their care of those we find to be tuberculous. I then speak to the school teachers and nurses, explain to them our method of work and ask for their help. So far this year we have received most hearty and sympathetic coöperation from this group of workers. It means outside work for the teachers but practically all of them are interested in the physical well-being of their children and give us their hearty support and assistance.

When the new plan for the work was talked over last year, one of the great difficulties in the minds of Dr. Chadwick and the others was whether the teachers would be willing to give the time and do the work that would make the Clinic a success. So far the coöperation of the teachers has been far greater than we had hoped for and we feel this problem has been solved. When the returns came in from one town, the superintendent of schools looked over the percentage of children for each teacher and he declared that it was almost a perfect grading in his estimation of the value of the teachers themselves in their regular school work.

The third group I speak to in each town, and in many ways the most important one, is the high school students themselves. I speak to every Junior and Senior High School taking from thirty to forty-five minutes in the assemblies to tell them just what the Chadwick Clinic means, what we are accomplishing and what we want them to do. So far, we are not getting as high a percentage of the high school group as we would wish but we are getting a larger percentage than we had expected. We have found from the first that we get a much better reception the second time we work in a town. I firmly believe that we shall get an increasing percentage of high school students as we continue this work. We are finding just what we expected to find, a larger percentage of advanced hilum cases in our high schools and we find pulmonary cases that are beginning to develop. The pulmonary cases that we find are usually without any symptoms whatever and are often entirely unsuspected by the child's family or teachers. If the Chadwick Clinic were to do nothing but locate these early pulmonary cases in adolescents, we would more than justify our work as a Clinic. With a school population of 11,503 in one town we found seven cases of early pulmonary tuberculosis.

There is another thing I feel I may mention right here and that is the fact that we are not getting as great a decrease in tuberculosis in the adolescent girl as in other groups. With the nervous and physical exhaustion that comes with the modern high school age, with the fashionable strict dieting (very often when food is eaten, it is the wrong kind) we are getting a new and very real problem in tuberculosis that we must meet.

Now, very rapidly; when the x-rays are taken, they are at once developed and read by Dr. Morgan at Westfield. His reports are back in our hand by the last of the week, the films that show some unusual markings are returned to the doctors and the physical examination is given to this group only. The parents of the children are notified so that they can come for the physical examination on the following Wednesday. In this way you will see the whole group of children is finished from the tests through to the physicals in just two weeks. After the report of the physical examination is returned to Dr. Morgan, he makes a final diagnosis and report to the parent of the child with the instruction that the child should be taken to the family doctor for his care. This is the new method of work adopted in September, 1929.

In the first five years of the work a total of 101,118 children were examined. This year we will examine over 49,000 and if we continue in this method for the next five years, we will succeed in doing more than twice as many children in our last five years than we did in the first five years.

There are very decided advantages in this new method. In the first place, we cause very little distraction in the schools where we work. The children are sent in from their classrooms for the test and are back again in the classroom and at work in less than half an hour. When the arms are being read, the doctor goes directly to the classrooms and the class is disturbed usually less than five minutes for the reading of the arms. The child who is to be x-rayed will lose about another half-hour and the child who is to have the physical examination (and, of course, this is the important child) will lose sometimes an hour, sometimes an hour and a half from the classroom, but the whole organization moves so rapidly and so smoothly that even in the larger schools with several hundred pupils there is very little disturbance.

We are testing 1500 children a week right along and we have much more assurance of covering our schools all over the State in reasonable time.

The new method of work requires an extra x-ray man but one doctor less. We have six small Ford cars for the staff and two Ford trucks for the x-ray outfits. This makes it possible for each doctor to work by himself and to get out to the home of the children who are absent from school on arm reading days.

After the Clinic has examined the children in a town, they are not merely dropped. We have

two groups that follow up our Clinical findings. First, the nutrition group. These workers strive to reach the parents of every child who has an abnormal x-ray film. They sit down with the parent and go over in detail the things that the individual child needs in the way of food, rest, and health habits. A detailed sheet is made out for each child in all of these matters and is given to the parents for their direction. In my mind this is an extremely valuable piece of work. It in no way replaces the work of the family doctor who should check up on the functions of the child's body and should make repeated examinations. We should use as much care, at least, in seeing that our children's mechanism is in good running shape as we use to check up on the running of a high-class automobile. But, in the matter of child feeding, rest and health habits the nutrition worker is of enormous value and does a type of work that is not covered by the family doctor. The problem of tuberculosis in children is largely a problem of rest, nutrition and health habits after the doctor has made sure that the human machine is functioning normally.

The second group of follow-up workers consists of a group of doctors and their staff who reëxamine all suspect, hilum, and pulmonary children every year, taking a re-x-ray that gives invaluable information as to the progress in each case. We have accumulated a group of child x-ray films that are simply invaluable for the study of tuberculosis in children. With each added year of the work the series of films increase in value and greatly add to our knowledge. Further, it is an enormous advantage to local health workers and the family doctors to have our follow-up men come in and reëxamine the children to re-waken the interest of the parents in carrying on this work to a complete healing of the tuberculous focus. We are getting a greater and greater appreciation of this work as it is continued and the doctors and local people understand the value of following-up new children. In a few isolated towns we still find some doctors who feel that they can take care of children after the original diagnosis has been made on the Clinic. However, most of the medical men have come to appreciate the fact that reëxaminations and re-x-rays are imperative to give them the information that they require in the giving of their treatments. The success of the Chadwick Clinic depends upon an understanding of the mutual dependence of the local doctors and parents upon the diagnostic work that the Clinic does, while we feel very keenly dependent upon the family doctor for the success of the treatment of the children between our examinations. A very interesting and valuable survey has been completed this year by Miss Wetherbee of the Division of Hygiene showing the work that was done in a city between the time that our Clinic was there in the winter of 1928 up to this year. The survey shows very clearly the class of people who failed to coöperate as we would wish and gives us information that will help us, we trust, to increase our efficiency. With certain groups of foreign-born children we find a good deal of fear and have difficulty in getting all the coöperation that is needed. Often, in these groups we find the percentage of reactions high. We also have the same problem among the very best class of people in the town. The highly-educated, wealthy parents are very apt to feel that they do not care to have their children examined by a "common State Clinic". Again, in this very class we find a heavy percentage of reactors. The children are very often rather exhausted with the modern life and high pressure in the wealthy home and in the human family, as in the whole animal kingdom, the highly-bred child is most susceptible to such diseases as tuberculosis.

You see the Clinic is not merely a routine piece of work. We have learned new things every year that we have worked, and have profited by the things we have learned. It was no simple problem to change from an underweight Clinic to a Clinic for all school children at the very beginning of the program—it has been a very large piece of work to change now in the sixth year to the new method of work that I have just explained to you. It is a very large job to arrange and have 1500 children ready for the Clinic to work on every week of the school year. It is a very real job to get the interest and support of your local school teachers and school children. It can be done and it must be done if we are to accomplish our aim and I believe that each year will find our task not only easier, but better done. The value of the Chadwick Clinics to every community where we have worked, to the schools, to the family physicians, and to the children, is beyond all estimation and as the doctors and school people in towns and cities are coming to appreciate this fact we are more and more obtaining their hearty support and coöperation.

We no longer have to beg cities and towns to let us come in and do the work. We have our schedule filled for this year and next year and more towns are clamoring for the years 1932 and 1933.

On the scientific side of our work we have many things that interest us. In the matter of the von Pirquet test we have checked and rechecked our readings and our doctors have read together so that we feel that our findings in the von Pirquet test are accurate and the work of one man and the work of one year are comparable with the work of other men and other years. We know, of course, that the von Pirquet test is not 100% perfect but in checking up and giving consecutive x-rays to non-reactors we have not found lung infections in non-reactors. This does not make us careless for we know that occasionally an infected child will not react.

We have done some work on re-testing and

checking on re-tests. We are not prepared to give any scientific reports on this matter for we have not done a sufficient number to satisfy us. It may interest you to know that so far we find about 8% of children who react and after a few years on a re-test are found negative. When you take into account the fact that two very experienced doctors will vary in the neighborhood of 2% to 3% in their judgment of what is a reaction this probably will explain from four to six per cent. at least of the 8% of reactions that have disappeared. There is no question at all about some of the reactors losing their reaction after a few years' interval. We hope before the Clinic is concluded to have a satisfactory number of re-tests to give some more valuable information on this matter.

Another thing that has held our interest and grows in interest is the number of perfectly clear pulmonary infections in children that give no symptoms at all at the time we find them. Personally, I feel that the interest and coöperation of medical men and the parents of adolescent school children should be aroused in every way possible to find these early pulmonary cases in our schools. When they are found early, there is much more chance for complete recovery. When a case has advanced sufficiently to show the classic symptoms of dullness and râles, it becomes a much greater problem. When the case has developed to the point of finding bacilli in the sputum, the problem is an extremely grave one. It is not only the welfare of the pulmonary child that is at stake. Our children are compelled to go to school and they have the right to an education; but they also have the right to be protected while they are in school and to be crowded in with cases of pulmonary tuberculosis is a thing that should not be tolerated. It is a responsibility we must face and we cannot evade.

In this connection, some work was done by the men at Saranac Lake and at Westfield State Sanatorium a few years ago that it is very well to recall. A consecutive group of cases was taken up and it was found that 8% of the pulmonary cases had none of the classical symptoms of tuberculosis (râles, etc.) while about 8% of the cases that did have the classical symptoms of dullness, râles, etc., on x-ray showed no tuberculosis. On the Clinics we have come through hard experience to know that we cannot diagnose with assurance a case of pulmonary tuberculosis without the x-ray, physical findings and history.

Just one thing more I want to speak of and that is the growth of our knowledge in the interpretation of x-ray films. Five years ago the chest film in children was a new thing and there were very many problems in regard to it. After examining 100,000 children and following the x-rays through and with the Follow-up Clinic Doctors checking these children up over several years we have a much greater and a much more definite knowledge of the value of the x-ray shadows which we find. A very interesting study was made by a group of men last year. One hundred films were picked out and gone over by three experienced doctors, workers in child tuberculosis. The bare films were taken without any histories and in one hundred films there was practically no variation with the three experienced workers. Where there was variation it was merely a matter of degree and whether a film should be called "suspicious" or early glandular infection. The films were gone over by other workers inexperienced in child tuberculosis and these men were often quite at sea as to the diagnosis. Personally, I feel very strongly that the reading of child films in tuberculosis is a work for child tuberculosis specialists. We have had considerable embarrassment with x-ray men who were not used to child films and read into them things that were not there and very often failed to see things that were there. Our most experienced men in child tuberculosis are very humble men and very cautious. Very often it is not a single film that counts but we repeatedly retake films in order to be more sure of our x-rays.

An x-ray taken three months or more after the initial x-ray is often of very great value and is almost always worth while if it can only be done. This year our Follow-up Staff will cover the entire State for the children who were done in the first five years. Additional x-rays are being taken and we will have an opportunity at the end of the year to assemble some very valuable information which will guide us in our future work.

Last year Dr. Chadwick invited Dr. Krause and a group of doctors to go over our work and give an evaluation of what we are doing. They were very much interested in the things that we had accomplished, gave some very valuable suggestions and advice and their very hearty support. The Clinic is constantly being visited from time to time by workers from other States and other Nations. We make every effort we can to keep in touch with the advances that are being made in solving the problem of tuberculosis.

I spent a week-end in March with Dr. Sabin and Dr. Doane of the Rockefeller Institute of New York. I feel and they feel that there is a wonderful development immediately ahead of us in our fight on tuberculosis.

The great problem of tuberculosis after removing the avenues of infection is to find the infections that have just started. After tubercles have been formed and the tissues broken down, cavities developed, mixed infections have occurred, the bacillus is found in the sputum, it is late in the day for hopeful treatment. Our hope lies in the finding of early infections, and where it is at all possible, to find them still in the glandular state. We must strive to find the infection before it has gone long enough to produce physical signs. A lung infection that gives physical signs is a difficult infection to heal.

Dr. Doane of the Rockefeller Institute is coming to Westfield and to our Clinic at the earliest possible moment to see what we are doing and to work with us in every way to advance our results with the very newest proved methods. The Chadwick Clinics intend to grow as long as they are working and if we can find new or better methods of work, we shall put them into use as we have done this year. We do not fear work. We do fear stagnation. We do not propose, however, to rush madly into any new enterprise; but we do not propose to stand still. As the Chinese Proverb says: "We do not mind the going slowly but we do not propose to stop".

This brings me to the final problem. The Chadwick Clinic is now in its sixth year and already the question is rapidly coming up as to what will be done after the ten years.

School Superintendents and Health Officers are beginning to ask us if we are going on with the Clinic. They say that they question the wisdom of getting their communities interested in childhood tuberculosis, facing out the problem, and then having the matter dropped. What will become of the child after the ten years? When the Clinic is doing such a fine piece of work why should it be dropped? Why should the next generation be denied the care that is being given to this generation? These are some of the questions that the school people, health officers, and parents are asking. They are questions that I cannot answer. However, I do not feel that the work in which Massachusetts is leading the world will be dropped at the end of the ten years.

I am being repeatedly called to other states where they are trying to establish like Clinics. In a few days I am going to Illinois where they have invited me to talk. After considering the work all over the country they feel that we have by far the best solution. I firmly believe that we can virtually eliminate tuberculosis from the lives of children raised on Massachusetts soil within my lifetime, with the Chadwick Clinics.

THE SUPPORT OF THE DRUGGIST IN THE CONTROL OF GONORRHEA AND SYPHILIS*

BY GEORGE H. BIGELOW, M.D.,† AND N. A. NELSON, M.D.†

MUCH has been said and thought and written concerning the dangerous practice on the part of some druggists of giving therapeutic advice and actual treatment to persons suffering from gonorrhea or syphilis. It was discovered, in a recent survey in Philadelphia[1], that more persons seek the advice of druggists concerning these diseases, than are treated by all the physicians, hospitals and clinics combined. This would seem to confirm the impression that druggists have the reputation with the public, of treating these infections. In fact, one-third of the Philadelphia druggists who admitted seeing cases of gonorrhea and syphilis, also admitted having treated them!

Some years ago the Massachusetts Department of Public Health sent a representative to several hundred of the drug stores in this state[2]. Druggists were urged to discontinue the sale of proprietary preparations for the treatment of gonorrhea and syphilis and to destroy their stocks-on-hand. Without exception, the druggists visited agreed to comply with the request. It was too expensive, however, to visit all the 2000 drug stores in the state, let alone make later follow-up inspections. Obviously, also, the druggist might still dispense pharmaceutical preparations or actually treat cases, even though the last bottle of quack remedy had been thrown out of the window. Policing, therefore, amounts to little more than an expensive gesture. It will be only when druggists themselves understand that both these diseases are so serious as to deserve the best of medical care, that they will refuse to accept the responsibility for improperly or inadequately treated gonorrhea or syphilis.

To the end that this point of view might be advanced, it was arranged, through the Secretary of the Massachusetts Pharmaceutical Association, that a representative of the Department of Public Health should meet with the Association at its annual meeting in January, 1930. The unanimous response to a request for coöperation took the form of the following resolution:—

> *Whereas* a considerable part of the prevalence of gonorrhea and syphilis is due to improper and inadequate treatment, as a result of self-treatment, treatment with proprietary preparations, and the advice of persons not qualified to treat either disease,
>
> *Be It Resolved* that the Massachusetts State Pharmaceutical Association at its annual meeting held in Worcester, Mass., this twenty-seventh day of January 1930, expresses its desire to coöperate with the Massachusetts Department of Public Health in its efforts to have gonorrhea and syphilis properly and thoroughly treated and, therefore,
>
> *Be It Further Resolved* that this Association deprecates the sale or advertisement of preparations designed primarily for the treatment of gonorrhea and syphilis, except on the prescription of a licensed physician.

Since this meeting, the Department of Public Health has mailed to the 2000 druggists in the state a copy of this resolution, together with

*From the Massachusetts Department of Public Health.

†Bigelow—Commissioner of Public Health for Massachusetts. Nelson—Epidemiologist in Charge of Venereal Disease Control. Massachusetts Department of Public Health. For records and addresses of authors see "This Week's Issue", page 182.

a letter asking for coöperation, a publication of the Department[3] describing the problem of controlling gonorrhea and syphilis, and copies of "Information for the Patient". A supply of the last named pamphlets was offered to any druggist who would give them to persons who seek his advice.

In spite of the fact that the pamphlets contain the statement that "the druggist knows nothing about the treatment of gonorrhea or syphilis", 190 druggists in 62 communities requested supplies.

Of course there are many druggists who refuse to prescribe for or to treat gonorrhea or syphilis,—probably the majority of them, judging from expressions at the meeting of the Pharmaceutical Association. But if every druggist who is in sympathy with honest practice would, in addition to assisting passively by refusing to accept a patient, place in his hands sound advice as to the importance of competent medical care, much more would be accomplished. Otherwise the patient, going to the drug store across the way and getting what he wants, is as effectively defrauded of his right to proper treatment as if he had been treated by the first druggist.

The Department of Public Health proposes to work for the active coöperation of every druggist in the state. At the same time we urge those physicians who treat gonorrhea and syphilis so to equip themselves for the proper and adequate treatment of gonorrhea and syphilis that the patient will be assured of something much better than the druggist can offer. Otherwise the infected prostate will remain ignored, the genital sore will still be "diagnosed" by inspection and treated only with ointment, the patient will continue in the same ignorance of the truth concerning his infection and his responsibilities and the efforts of the Department to secure early and adequate treatment at the hands of a competent physician will be frustrated.

The patient who has been sent to a physician by an honest druggist has a right to better treatment from the physician than the druggist could have given him. Inadequate treatment of gonorrhea or syphilis in the physician's office or in the clinic is far more reprehensible than drug store treatment because its inadequacy is camouflaged by the label of medical care. Its victims are defrauded, in the name of medicine, of the one thing they have a right to expect and believe they are getting,—proper and adequate treatment and sound advice.

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PLAY SPACE FOR THE TODDLERS

One of the greatest problems which city mothers have to face these days is that of finding safe play space for their children. The problem of the little preschool child's outdoor play is especially acute, for most cities, until very recently, have not been awake to their responsibility in this matter and have not made special provision in their playgrounds for the toddlers. As a consequence, the older children use all the play space for their games, and the younger children, absorbed in their small affairs, are literally bumped and jostled out of the way.

Throughout the country, however, cities are beginning to recognize this problem and to include even the babies in their park and playground programs. In one southern city, for instance, the park department has provided a shallow wading pool for the exclusive use of the preschool youngsters.

Other cities provide sand boxes and such things in shady corners of some of their parks, and a few here and there are installing play fields with complete equipment in miniature.

But the provision of play space in some distant park or playground is not enough, for busy mothers may find the journey too long and too expensive to take very often.

In one of New England's industrial centers the problem has been, at least partially, solved by the use of portable playgrounds which visit different parts of the city on stated days during the summer months. On playground day a side street in the district to be visited is closed to traffic. Slides, teeters, swings and other simple pieces of apparatus are set up by the park department. The festivities proceed under the capable direction of two recreation supervisors who travel with the playground.

Since this work is carried on during the vacation period, children of all ages come to join in the fun. Those who are old enough to play group games do so, but the play supervisors are careful to see that these games do not encroach upon the activities of the three- and four-year olds.

The street playground idea is, of course, not new. Many cities have taken advantage of roped-off side streets as a cheap way of providing play space in the heart of thickly populated regions of the city. "Block parties" for the older children and impromptu wading parties, by courtesy of the fire department, have come to be a familiar part of the summer scene in many of our larger cities.

Lately, however, the wisdom of street playgrounds has been questioned by some of the teachers who have been carrying on school safety campaigns emphasizing the danger of careless street crossing and play. Children, according to these observers, have not the judgment to distinguish between the times when a street is officially a playground and the times when, having resumed its official status as a street, it becomes a danger spot.

Last year more than a hundred thousand children were hurt while playing in the street, but the heaviest mortality occurred among the children under five years of age, a group which is not reached by safety campaigns or cared for by school playgrounds, so it would seem that safety education must begin in the nursery.—*Margaretta Willis Reeve, President, International Federation of Home and School; Chairman of Committee on Recreation and Physical Education for the Preschool Child, White House Conference on Child Health and Protection.*

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 16301

HEADACHE AND DIZZINESS

NEUROLOGICAL DEPARTMENT

A Russian thirty-eight years old, a restaurant counter-man, entered January 10 complaining of headache. He had some language difficulty, was markedly slowed mentally, and dropped asleep if his attention was not held. He seemed quite intelligent, however, and the history was thought to be reliable except in details.

December 15 he first noticed headache and periods of dizziness. The following day the headache was so severe that he had stayed in bed since that time, going out for his meals. The headache had always been frontal, but had occasionally radiated over the brow to the right. He had periods of dizziness lasting five minutes on getting up. Since the onset the sight of food had nauseated him, and until a week before admission he had had a very bitter or sour taste in his mouth on seeing or tasting food. On December 17 he vomited from six in the morning until noon. On December 19 he vomited two or three times and on December 21 once. For two weeks his appetite had been very poor. Two weeks before admission on getting up everything went black before his eyes for several minutes. A week before admission he found that after reading for a few minutes the print looked like a solid black line. At the same time he noticed a buzzing in his left ear. Since the onset he had had increasing weakness.

All his life he had had attacks of extreme nervousness and irritability, for which he had frequently been beaten. Eleven years before admission he had an attack of palpitation and marked dyspnea. He spent two months on a farm and had had no more of that trouble. Between one and two years before admission he had night sweats and severe cough for two months with considerable reddish-black sputum, on one occasion blood streaked. A physician advised him to go to a hospital. He spent two months in the mountains and gained fifteen pounds. He denied venereal disease and the use of alcohol.

Records of the Out-Patient Department show that he came on August 24, a year and five months before admission, complaining of vague chest pains, dry throat, occasional huskiness and rare dry cough of two months' duration, keeping him from working as a porter. He had gained eight pounds in two months. Examination was negative except for possible slight fullness over the suprasternal notch. A Hinton was negative. X-ray examination showed several small rounded shadows of increased density with sharply defined margins in both lung fields. At the angle between the heart and the diaphragm on the right there was a large area of increased density which obliterated the outline of the right border of the heart and the diaphragm. The costophrenic sinus on this side was hazy and shallow. There was no evidence of cavity. The heart shadow was roughly triangular in shape, somewhat increased in size. On September 7 he reported feeling better, and on October 5 very much better. He had been working for three weeks. He now had a vague substernal distress on getting up in the morning. Examination was negative except for flatness throughout the abdomen except over the stomach, probably due to obesity and fluid in the intestines. October 19 he complained of more or less continuous pain at the base of the skull and in the frontal region, worse in the morning. November 16 the pains in the chest had returned, forcing him to stop work. He told of coughing up blood several months ago. He had lost four pounds in two weeks. Another X-ray examination showed that the process in the chest previously described had largely disappeared. The only variation from the normal still present was thickening about the right hilus and the right descending bronchus. November 23 he felt very well, had gone back to work and had regained the weight he had lost. He was referred to the Pulmonary Clinic, but did not report there, and was not seen again for eight months. July 15, six months before he entered the wards, he returned to the Out-Patient Medical Clinic. He had felt very well and had worked steadily without symptoms until a week before the visit, when after lying out on the beach for three hours he had pain in the left flank which had grown worse. It was aggravated by motion and radiated up the left costal margin. He had pain when he lay on the left side, but was comfortable on the right side. Examination showed pallor and a palpable mass, presumably the kidney, in each flank after deep inspiration. The liver edge was one to two centimeters below the costal margin. The knee jerks were sluggish, the ankle jerks not obtained. July 29 he reported that the pain gradually passed off in a week. He had had slight pain in the right side of the throat for two days. Examination showed small ragged tonsils, probably chronically infected, and a palpable slightly tender gland in the right anterior chain. He was not seen again until January 2, eight days before he entered the wards. His chief complaint was then dizziness. He was referred to the Eye

Clinic. Examination of the external eyes was negative.

Clinical examination showed a well nourished man with slightly pale and yellowish skin, dry on the insides of the upper arms and markedly cornified on the feet. Face asymmetrical; right lower jaw higher than left and distance from midline to right corner of the mouth less than to the left. Palate deviated to the right. (He insisted that he had had the facial asymmetry all his life.) The left lung showed slightly diminished resonance throughout the back. Descent of the right lung slightly less than that of the left. Apex impulse of the heart seen and felt 9 centimeters from midsternum, one centimeter outside the left border of dullness. Occasional doubling of the diastolic sound at the apex. No other abnormalities were found on general physical examination.

Neurologic examination. Fundi: bilateral papilledema. Left facial weakness. The eye did not seem to be involved. Tongue protruded in the midline without tremor. Knee jerks obtained on reënforcement only; otherwise the reflexes were normal. Grips equal though rather weak. Coördination tests well done. All sensory tests normal.

Urine: amount not recorded; findings normal. Blood: hemoglobin 80 per cent, reds 3,910,000, leukocytes 15,300.

Temperature 96.1° to 98.4°, with a terminal rise to 104.4°. Pulse and respirations normal except for a terminal rise to 100 and 31.

X-ray examination of the skull was negative. The sinuses showed moderate thickening of the lining membrane without retained secretion.

A nose and throat consultant reported on January 10, "The nose shows marked swelling of the right middle turbinate and the inferior turbinate. Membrane pale and boggy, with secretion on the right side."

January 11 the patient showed an unsustained horizontal nystagmus. There was no suggestion of Romberg. Examination of the visual fields and acuity was of little value because the patient was unable to follow directions.

January 13 he complained a good deal of headache. A lumbar puncture was done in the fourth-fifth lumbar space, and 12 to 14 cubic centimeters of clear colorless fluid withdrawn under increased pressure,—initial pressure 260, combined jugular pressure 630 to 270, final pressure 70. The headache was much relieved after the withdrawal of a few cubic centimeters. The fluid showed no cells; alcohol, ammonium sulphate and Hinton tests negative, total protein 74, colloidal gold 5443332100, sugar 75.5, chlorides 720. That day a nodule was palpated under the left costal margin, and a mass descending from under the right costal margin on deep inspiration. The next day the patient complained of right occipital headache radiating forward to the frontal region, and said he had not slept all night. The following morning he was found unconscious and could not be roused. He was sweating profusely. The rectal temperature was 103°. Two hours later he was still unconscious, flaccid, with absent tendon jerks and no response to plantar stimulation. The right pupil was five millimeters in diameter, the left two millimeters. Neither reacted to light. The breathing was easy and rather rapid. Numerous coarse moist râles were heard at both bases. Another lumbar puncture done in the fourth-fifth lumbar space gave 12 cubic centimeters of colorless opalescent fluid under an initial pressure of 410, combined jugular pressure 700 to 410, final pressure 35; cells, 6 lymphocytes, 7 mononuclears, 678 red blood cells; alcohol positive, ammonium sulphate negative, sugar 78.6, chlorides 734.

That day, January 15, the patient died.

Clinical Discussion

BY RICHARD C. CABOT, M.D., AND GEORGE W. HOLMES, M.D.

NOTES ON THE HISTORY

The older books on diagnosis or the practice of medicine talk a great deal more about what goes on in the mouth, talk a great deal more about coats on the tongue or tastes in the mouth than we do now. The reason those things are dropped out of modern medicine is that on the whole we do not learn anything important from them, nothing not shown better by further examination. In this case, knowing he has had tastes in the mouth will not help us. If I had been taking the history I should not have put it down. It goes along with having a poor appetite and with whatever cause has produced his headache.

"Everything went black before his eyes for several minutes." That is fainting. Anyone who was looking on would have said what else he did. But this is often all the patient's description of fainting.

I cannot make anything of his improvement after two months on a farm.

That attack one or two years before admission might perfectly well have been an attack of tuberculosis and it might perfectly well be a bronchitis or something quite different from either, that I cannot guess.

The Out-Patient record is a good deal earlier than we know of him here.

The gain in weight is surprising in view of the other symptoms. We should expect him to lose and not gain.

The fullness over the suprasternal notch makes us think of aneurysm or mediastinal glands.

Dr. George W. Holmes: This is the earlier film, the one spoken of as showing rounded shadows of increased density. Here are the

shadows, very small, quite indefinite. Perhaps more important is the larger shadow which occupies the greater part of the region between the heart and the diaphragm on the right side in the region of the cardiophrenic angle. The heart shadow is apparently somewhat enlarged. We have no actual measurements or films taken for the heart. It looks a little large and triangular. We have another film in which practically all those shadows have disappeared.

DR. CABOT: Did he have any treatment that you know of between those two examinations?

DR. HOLMES: No. These shadows look like metastatic nodules in the lungs. I do not think they would disappear if that is what they were. That looks like a bronchopneumonic patch. It may have been an infarct. The smallest shadows I do not know how to explain.

DR. CABOT: Are the apices all right?

DR. HOLMES: Yes, perfectly clear. The diaphragm is all right. I suppose those could be small bronchopneumonic areas.

DR. CABOT: This second film you would call normal aside from some enlargement of the heart?

DR. HOLMES: Yes. Of course one of the things to be considered is the possibility that the films got mixed up. But this looks like the same chest.

DR. CABOT: The improvement in the patient's health goes along with this improvement in the films.

What is the significance of thickening about the right hilus and the right descending bronchus?

DR. HOLMES: Those are very vague things.

DR. CABOT: I am glad to hear you say so, because we used to depend a great deal on things of this kind. After these students graduate and get away from their moorings here they may be shown films like that and be told they are evidence of serious disease.

Presumably if what they feel in the abdomen is rightly a mass it is not the normal kidney.

NOTES ON THE PHYSICAL EXAMINATION

That yellowish color of the skin must have come on since the earlier examinations. That is why I wish we had someone who saw him in the Out-Patient Department, to know whether he had it at that time.

We certainly cannot make a diagnosis of heart disease on this evidence.

The X-ray examination of the skull does not help us there as to what goes on inside the skull.

I suppose the larger proportion of our fellow citizens have about as much as that nose and throat examination showed.

When we have suggestions of brain tumor we are always cautious of doing a lumbar puncture. Sometimes the patient dies suddenly after it. However, if the fluid is let out very slowly we can usually avoid trouble.

The fluid showed no cells, therefore no evidence of meningitis.

The colloidal gold certainly looks like syphilis. If there is any other way of reading it I do not know it.

DIFFERENTIAL DIAGNOSIS

Certainly the natural thing to think of first is a neoplasm somewhere. A neoplasm is suggested by his anemia and by these masses in the region of the kidneys or perhaps of the spleen and liver, we cannot tell exactly which, on one occasion said to be nodular. These brain symptoms, as you remember perhaps Dr. Wolbach told us the other day, very often come as a result of metastases of tumors elsewhere. If I remember, the tumor which was metastasizing last week at the Brigham Hospital was in the lung. If that second film belongs to another patient we might still say it is in the lung here. But the patient improved so tremendously at the time that we shall have to say that film is correct, and we have no evidence of disease of the lung. I think meningitis may be excluded. In the beginning pulmonary symptoms, ending up with cerebral symptoms, and the lumbar puncture showing no cells,—all that is very hard to make consistent with any meningitis. He is young for cerebral hemorrhage. We have none of the usual concomitants (in the way of focal symptoms) for serious hemorrhage. We have blood in the second tap fluid. I do not know whether the tapping was done in such a way that they could certainly exclude blood from the operation of tapping itself. We have to think of something that could bleed, and that could be neoplasm well enough. I feel quite uncertain as to what organ is the seat of the primary focus. It might well be a hypernephroma, though the metastasis is not characteristic. As to the brain symptoms, I should say they were from neoplasm, that he had marked internal hydrocephalus and symptoms due to that hydrocephalus.

A STUDENT: What was the hospital diagnosis?

A PHYSICIAN: A question of central nervous system syphilis, doubtless on account of that colloidal gold reaction, and bronchopneumonia.

A STUDENT: Is there any chance of its being tuberculoma?

DR. CABOT: I do not know how to exclude it.

A STUDENT: Would you expect as high a white count in neoplasm?

DR. CABOT: Yes, you can have any white count in neoplasm, high or low.

A STUDENT: Could you localize the brain tumor in the frontal lobes from the mental dullness?

DR. CABOT: When we get internal hydrocephalus the frontal lobes receive part of the pressure. We certainly have hydrocephalus in this case. I very seldom undertake to localize

brain tumors. I have seen surgeons go in on the wrong side or in the wrong relation to the tentorium too often to feel any confidence.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Central nervous system syphilis?

DR. RICHARD C. CABOT'S DIAGNOSES

Neoplasm, perhaps hypernephroma, primary focus unknown, with metastasis to the brain.

ANATOMIC DIAGNOSES

Primary fibrosarcoma of the brain.
Primary carcinoma of the pancreas with metastases to both adrenals and the heart.
Adherent pericarditis.

PATHOLOGIC DISCUSSION

DR. TRACY B. MALLORY: The autopsy showed some most unusual findings which are still puzzling us for a correct interpretation. A nodule of tumor five centimeters in diameter was found in the right frontal lobe. This was of unusual firmness and whiteness. Both adrenals were completely replaced by huge tumor masses which were in themselves almost wholly necrotic and filled with fluid hemorrhagic contents. The tumor in the left adrenal was about twice the size of that in the right and measured 25 by 15 by 15 centimeters. The tail of the pancreas was adherent to this mass.

At the time of the necropsy we jumped to the conclusion that we were dealing with a neuroblastoma, the commonest tumor of the adrenal medulla. This is frequently bilateral and typically metastasizes to the head. It is, however, extremely rare except in childhood.

The other gross findings of significance were a totally adherent pericardium and a nodule of metastatic tumor in the right auricular wall.

Microscopic examination revealed our error and showed that we were dealing with two independent primary malignant tumors. The tumor in the brain was a well differentiated, rather slowly growing, perfectly typical fibrosarcoma. This is a very rare primary site for a tumor of this character. The tumors of the adrenals, the tail of the pancreas and the heart were similar to each other in character but totally different from the brain lesion. They were extremely undifferentiated, very rapidly growing, largely necrotic. In some areas there was a recognizable alveolar arrangement and the cells could be identified as epithelial. This was particularly true of the tail of the pancreas, where the appearances were entirely consistent with a primary carcinoma of that organ and the histologic findings did not at any point suggest any recognized type of primary adrenal tumor.

DR. HOLMES: Was there anything that would account for the anemia?

DR. MALLORY: No. We did not examine any of the bones. I think it is very probable that they were involved.

DR. CABOT: Is there anything to be said from the point of view of your department about the colloidal gold reactions?

DR. MALLORY: No. Dr. Adamson can perhaps tell us something about it.

DR. G. L. ADAMSON:* When the patient first came to the hospital a diagnosis of brain tumor was made; right frontal or temporal lobe. After we palpated the abdominal masses we had to think further, and the closest we came then was carcinomatosis. The diagnosis of central nervous system syphilis was made at death because of the colloidal gold reaction and before we had received the Wassermann reaction report.

*Resident on the Neurological Service.

CASE 16302

FIBROSARCOMA OF THE NASAL SINUSES SECONDARY TO A PRIMARY TUMOR OF THE SCALP

EYE AND EAR INFIRMARY

A six-year-old girl of American parentage entered the Eye and Ear Infirmary on January 20. The immediate complaint was protrusion of the right eye for three weeks.

She was an only child. The family history is negative. She had had no illnesses until the present one except an uncomplicated case of measles eleven months before entry.

Fifteen months before entry she was kicked in the right temporal region by a playmate. The region became slightly swollen. This swelling persisted and began slowly to increase in size. February 9, three months after the kick, this growth was excised by a local surgeon. A portion of the growth was sent to a pathologist who made a diagnosis of sarcoma. February 14 the patient was taken to Boston, where Dr. Greenough saw her and recommended X-ray therapy. She was given four treatments at intervals of one month, the last on July 14. In spite of this treatment the tumor recurred at the site of operation and continued to increase slowly in size.

In August she was taken to a clinic where radium treatment was instituted. At that time the tumor was about 5 by 2.5 centimeters in size. The right preauricular gland was enlarged to about 1.5 by 1.5 centimeters. Four ten-milligram radium needles were buried in the main growth and one ten-milligram needle in the gland and left *in situ* twelve hours.

One month afterwards she was seen. There was no evidence of the growth.

In November there was a recurrence in the cheek, closely adherent to the antrum. There was no recurrence at the first site. Five radium needles were buried in the growth for twelve hours. Following this the growth decreased in size.

In December the patient had a bulging of the right eye. X-rays showed an involvement of the antrum. She was given a surface application of radium of 250 milligram hours above the right antrum. The growth rapidly increased in size. Another irradiation was done, this time five ten-milligram needles being buried for twenty-four hours.

She entered the hospital a month later. Physical examination at that time revealed nothing abnormal aside from the local condition. Radical removal of the growth was done by Dr. Barnes a few days after admission. The antrum was cleaned out, the lateral nasal wall taken down and the ethmoid cells exenterated. Furthermore, she was given 2160 milligram hours of irradiation with radium.

The wound became foul and suppurating. She developed a severe conjunctival edema with more or less fixation of the eyeball. She could perceive light, and the fundi appeared normal. Necrotic tissue had to be removed daily, the wound being packed with strips of gauze moistened with compound tincture of benzoin. It was found necessary to extract a tooth. Her temperature ran between 100° and 102° Fahrenheit for a month after admission. No cause for the fever was found outside the wound. Gradually the wound suppurated less. No recurrence could be made out. She was given a transfusion of 500 cubic centimeters of whole blood 37 days after operation. The eye continued to be swollen. A sequestrum was formed in the malar bone. Two more teeth were extracted. Her condition changed very little except that after a time the eyelids on the right seemed more swollen.

March 31 the sequestrum of the remaining malar bone was removed under ether anesthesia. Following this operation the wound seemed somewhat better for a while. Gradually however a swelling developed in the right temporal region. This was incised April 29. At operation the bone was found to be eroded by tumor cells, and a finger could be passed to the dura. No pus was obtained. Eye consultants advised against enucleation of the eye.

Her general condition became steadily worse. She grew increasingly drowsy. Her temperature ranged from 102° to 104° Fahrenheit. A small hemorrhage from the wound was controlled by packing. She took practically nothing by mouth. On May 13 she died.

Laboratory findings.

January 20. Leukocytes 6,500, red cells 4,500,000, polynuclears 42 per cent, large lymphocytes 22 per cent, small lymphocytes 18 per cent, large mononuclears 18 per cent.
January 28. Leukocytes 11,300.
January 30. Blood culture negative after 48 hours.
February 5. Tuberculins (1:1000) negative.
February 10. Urine: specific gravity 1.020, acid, no albumin, no sugar; sediment, a few leukocytes, a few epithelial cells, mucous shreds.
February 12. Leukocytes 10,500.
February 18. Leukocytes 16,800.
February 27. Leukocytes 12,200, red cells 3,600,000, hemoglobin 60 per cent.

X-ray reports.

January 20. Thymus negative. Sinuses: marked destruction of the right malar and the superior maxilla with extension into the orbit.
February 11. No evidence of metastases in in the chest, ribs or spine.
February 13. Marked destruction of the right superior maxilla and the malar bone, with osteomyelitis of the malar bone and the outer rim of the orbit. There is a mass on the right side of the nose. The left antrum contains secretion, but no evidence of new growth.
March 11. No further extension of the osteomyelitis can be made out.
March 21. A small part of the malar bone is not destroyed, but remains as a sequestrum at the outer rim of the orbit.
March 29. The malar bone sequestrated.
April 16. Extension into the temporoparietal region and the floor of the orbit.

Clinical Discussion

BY HARRY A. BARNES, M.D., AND GEORGE W. HOLMES, M.D.

Dr. Barnes: Her first dose of radium irradiation was 480 milligram hours and her second 600 milligram hours. I should consider this dosage rather small. I am presupposing, of course, that the needles used were of platinum-iridium.

On entering the Infirmary she had a tumor mass over the right antrum about the size of the end joint of the thumb, firmly adherent to the skin and to the bone but with no ulceration.

This first film shows the nasal sinuses at the time of admission. There is involvement of the right antrum and the right ethmoid. The right os planum is partially eroded, as is also the right antro-orbital wall. This accounts for the exophthalmos outward and upward,—that is, the pressure was from below and from the inner side. There is marked destruction of the inner half of the right malar bone. The eye-grounds were normal. The eyesight was normal. The child's general condition was good.

Three things occurred to us that we might do in this case. The first was irradiation with radium or the X-ray in larger doses from the outside. I have never seen such irradiation make any marked impression on these deep seated tumors of the sinuses. If there is an ethmoidal tumor the chances are good that there

is also a sphenoidal tumor, and that, as you know, is pretty deeply seated in the head. The second possibility was the insertion of radium needles directly into the antral tumor through the naso-antral wall. This plan did not seem feasible, as it would take tremendous doses to have any effect on the posterior ethmoids and the sphenoid. We decided finally to remove the tumor surgically and to irradiate the operative field immediately with radium. That is what I am in the habit of doing with all these sinus tumors, no matter what their character may be, with the exception of the lymphoma. That responds so readily to irradiation that it is well to try that first.

The operation was the usual one. By the way, these things never extend upward into the frontal sinus. They go backward into the sphenoid if given time; probably three-quarters of them involve the sphenoid when we first see them. The incision begins at the naso-maxillary suture line, passes downward and outward on to the cheek and ends well out on the malar bone. We can remove any tumor, whether it involves the antrum, the ethmoid, the sphenoid, the septum, the palate, the sphenomaxillary fossa, through this incision and without making any other external cut. The tumor in the cheek was found to be entirely distinct from the one in the antrum. We had supposed that there was but one tumor that had broken through the front wall of the antrum and presented under the skin; but the front wall was found intact. If I remember rightly, the sphenoid was involved in this case, though the hospital record makes no mention of it. As the X-ray shows, the tumor had broken through into the orbit from both the antral and the ethmoidal area. All gross parts of the tumor were removed, but the eye was left. I never remove the eye if there is enough supporting tissue left to hold the eyeball in place. I do this because even if the patient does not get the sight of the eye, at least an eye of that sort is better than a glass eye from the aesthetic standpoint. The orbital fat is very resistant to the extension of these tumors, because of its lack of blood vessels I suppose. I have had at least half a dozen cases of orbital involvement in which the eye was left that are now alive and well, with sight unimpaired, after periods of from five to twelve years after operation. So I think it is best to wait. It is always possible to do an exenteration of the orbit afterwards if there is evidence of recurrence there. I do not think it jeopardizes the chances of the patient if you wait. In this case the inner half of the malar bone was necrotic and was removed.

The radium was placed in the operative cavity while the patient was under ether. Three platinum needles of 10 milligrams each were used. A total dosage of 2160 milligram hours was given. In adults I usually give from four to six thousand milligram hours. My reasons for using this tremendous dosage is that tumors of the sinuses cannot be removed by a clean cut that does not enter the growth. As a matter of fact they are literally crushed out, and the walls of the operative cavity must be completely washed over with malignant cells at the end of the operation. Immediate radiation in these large doses I believe destroys these microscopic implantations. I have never seen bony necrosis from such doses, unless we can call this case one. I have never seen even the septum affected by it. The reason for this is the thorough screening that is used. The platinum needles are .2 mm. thick; these are placed in a brass capsule .5 mm. thick; this is wrapped in from one half to one mm. of lead foil and the whole is packed in the operative cavity with gauze in such a way that the nearest surface is at least one cm. away from the radium. About forty per cent. of the carcinomas treated in this way have remained without recurrence and without evidence of metastases for periods of from four to twelve years.

The patient did well except that she had a temperature of 101° to 103° for some weeks after the operation. There was a good deal of superficial sloughing; but I never have seen this surface sloughing cause a temperature even in adults, where the size of the operative cavity is so much greater. She had a great deal of swelling of the eye, and very soon an osteomyelitis of the malar bone became evident by X-ray, which explained the temperature. This film shows the process extending back as far as the greater wing of the sphenoid. Osteomyelitis is one of our most dreaded complications of sinus disease. When it occurs in the diploic bones of the skull it spreads like a grass fire without any tendency to self-limitation or sequestrum formation. The patient finally dies of a septic meningitis or a brain abscess. One or both are usually found at autopsy. In the bones of the face the thing is not quite so hopeless. Transfusion helps to limit its spread, and in this case 500 c.c. of blood was given. This last film, taken two weeks after the transfusion, shows the process stopped and a sequestrum which includes practically the whole of the malar bone. The sequestrum was removed two weeks later. At that time a small amount of granulation tissue was found deep in the orbit over the great wing of the sphenoid. Biopsy showed this to be a recurrence of the tumor. The patient finally died of a purulent meningitis. The path of the infection was not from the sinuses but from the primary lesion in the temporal region.

Dr. George W. Holmes: The type of tumor probably has as much to do with the success or failure of radiation therapy as anything else. Tumors of the type Dr. Barnes treated here are very resistant to radiation, and his dose is probably the correct one. It is necessary to give the correct dose even though there is some real risk; otherwise it is better not to do anything. I do not think there is much danger from bone necrosis unless the radium is placed close to the

bone. Probably that is the reason why Dr. Barnes has been so successful in avoiding bone necrosis,—he had a fair distance between the bone and the radium all the time. In the lymphomas, which are very sensitive tumors, operation and massive treatment are not indicated. Lymphomas are always part of a systemic disease and are sensitive to external radiation. I agree that radiation with high voltage therapy is of no value in such a case as this.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Sarcoma of the right face involving the maxilla and the maxillary sinus, the malar bone, the temporal bone, the ethmoid bone and the ethmoid sinus.

ANATOMIC DIAGNOSES

Fibrosarcoma of the right face involving the maxilla and the maxillary sinus, the malar bone, the temporal bone, the ethmoid bone and the ethmoid sinus.

Acute purulent meningitis.

PATHOLOGIC DISCUSSION

DR. TRACY B. MALLORY: The autopsy was limited to the head. There was quite extensive invasion of the tumor backward through the bones at the base of the skull, also into the dura, a considerable area of which, along the base of the brain, was infiltrated with tumor. There was also very extensive infection and an acute purulent meningitis which undoubtedly was the immediate cause of death. The intermixture of tumor and infection was so great that it was practically impossible to tell at autopsy where the tumor stopped and where the inflammatory infiltration began. There were both infection and tumor without any doubt in the left parietal and in a portion of the left frontal bone, the first of which was close to the site of the primary tumor. The other recurrence seemed to be just posterior to the region that had been operated on.

I have some sections from the tumor, one from a biopsy, the other taken at autopsy. Both show essentially the same picture. The section from the biopsy showed very dense fibrous scar tissue which is being infiltrated by a rather cellular tumor which in some areas shows definite spindle cells. I think there is not much question but that it is a fibrosarcoma. On the edge of the tumor there were numerous spicules of bone, so that from this as well as from the history we immediately wonder if we are not dealing with an osteogenic sarcoma. The histologic evidence is rather against such an assumption, though it is impossible to rule it out absolutely. The arrangements of these spicules of bone, the dense fibrous tissue around them, the fact that the bones are not in immediate contact in any place with tumor cells, suggests that this represents callus formation stimulated by destruction of bone by the invading tumor. There is no bone formation in any of the sections within the tumor itself, so that I think the original tumor was probably a fibrosarcoma arising from some of the soft parts rather than a primary bone sarcoma. It is not possible however to make an absolute decision on that point.

This second section is from the autopsy specimen of the dura, showing extension of the tumor directly into it. There is a mass of very densely staining cells consisting almost solely of nuclei, no cytoplasm at all,—a highly malignant type of tumor. Again there is no evidence at all of bone formation.

DR. HOLMES: Would you consider that a type of tumor that would be rather resistant to radiation?

DR. MALLORY: I should certainly expect it to be. Certainly in this location, with the dense amount of fibrous tissue surrounding it on all sides, I should not expect it to respond at all well. I know very little however about what the radiosensitivity of fibrosarcoma in other parts of the body is.

DR. CHARLES A. PORTER: Fibrosarcoma is locally malignant and usually not responsive to X-ray.

DR. BARNES: Fibrosarcomas in the nose and sinuses are practically non-malignant. They will recur locally unless you get them completely out, but they never metastasize.

DR. PORTER: I think malignancy in the sinuses is very much less than in other parts of the body.

DR. MALLORY: I have seen several tumors from the region of the nose and sinus which histologically looked highly malignant and on which elsewhere in the body I would give a bad prognosis, and yet operation has apparently effected a complete cure.

DR. BARNES: Tumors of the sinuses in general can go on for a long time without giving metastases, sometimes more than a year, and we can obtain perfect results from operation. Altogether I think that is a long time for a highly differentiated carcinoma to remain a localized tumor.

DR. PORTER: I think you are fortunate in the region in which you operate.

DR. MALLORY: This tumor of course was not primary in the antrum, since it started in the temporal region. Consequently it need not surprise us that it did not behave like the usual primary antral tumors.

DR. HAROLD L. HIGGINS: What was the organism causing the meningitis?

DR. MALLORY: We did not get a culture.

DR. BARNES: The majority of them are staphylococcus.

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DR. ARTHUR CONAN DOYLE

DR. ARTHUR CONAN DOYLE is another of the long line of eminent men of letters to whom the medical profession may justly lay claim. Beginning his career, like so many doctors, highly educated and of fine heredity, but impecunious, his early struggles were those of a small general practitioner in Southsea. But his literary genius could not be stifled by professional routine and he soon became world famous as the creator of Sherlock Holmes and Dr. Watson, prototypes of fiction who, like Cyrano and Hamlet and Mr. Pickwick, have assumed permanent reality. Like them, too, Doyle's characters were sketched from life; for Holmes is avowedly a likeness of Dr. Bell of Edinburgh, and in Watson one cannot help seeing at least a caricature of the author. Thus Doyle, drawing like all great writers from the experience of his own life, has enriched the portraiture of humanity. Sherlock Holmes is the diagnostician of crime, employing the methods of the astute physician. Dr. Watson, his friend and foil, is as essentially complementary to his character as Horatio is to that of Hamlet. Not all medical men of letters have so successfully taken from their profession the material of creative composition.

Dr. Doyle's literary pursuits, which won him wealth and honor, soon supplanted his medical practice. In the middle period of his life, however, he did active service, both medical and literary, to his country in the Boer War and the World War. Perhaps it was partly the emotional experiences of the latter, in which he lost his son, perhaps it was partly the ripening of years, which led him in his last decade to an absorbing interest in the immaterial universe. However one may personally regard spirit phenomena, one can have nothing but respect for the courage, earnestness, and sincerity of belief such as Dr. Doyle's. If he did not prove that he was right, no more is it conclusively proved that he was wrong. It is the essence of the immaterial to be insusceptible of material proof. It has been said that where there are three doctors, there are two atheists, but this is something of a slander on our profession. Pasteur was a great scientist and a devout religionist as well; nor in the field of spirit investigation should we forget our own Dr. William James. Other fields, at first as unknown and as seemingly unknowable as that of the spiritual universe, have at last been successfully penetrated. Very likely physical death, with which doctors of medicine are so familiar, is the only door through which knowledge of the mysteries of spirit may be entered. Now that Doyle has passed that door, we may think of him as knowing at last the truth which has made him free. And of him, as of the memories of all just men made perfect, we may remember the lines of Dr. Oliver Wendell Holmes:

"Build thee more stately mansions, O my soul,
As the long seasons roll.
Let each new dwelling, nobler than the last,
Shut thee from Heaven with a dome more vast,
Till thou at length art free,
Leaving thine outworn shell by life's unresting sea."

THE CONTROL OF GONORRHEA AND SYPHILIS

EARLY diagnosis, proper and adequate treatment and careful instruction of the patient as to proper conduct, are of vital importance in the control of gonorrhea and syphilis. Those who attempt to take the place of the qualified physician in these procedures assume grave responsibilities. Not only do they defraud the patient of his right to early, competent, individualized medical care, but they leave him, in

ignorance, to spread his infection. Too many innocent wives and children are bearing the unjust burden of disease acquired from men who "thought they were cured".

Consequently it is with considerable interest that we note the coöperative spirit in which the Massachusetts Pharmaceutical Association has joined with the State Department of Public Health in its efforts to direct patients with gonorrhea and syphilis to early medical care. That a responsible organization should deprecate the advertisement and sale of proprietary preparations for the treatment of these diseases is to be expected. We presume that the majority of its members are agreed that dispensing pharmaceutical preparations only on the prescription of a licensed physician is the ethical and honest procedure. But that the Association should align itself with the Department in urging all druggists not only to leave gonorrhea and syphilis alone but also to advise patients to seek competent medical care, is evidence of active, rather than passive, coöperation. That ten per cent. of the druggists, as reported elsewhere in this issue, have supplied themselves with pertinent educational material for those who seek advice is even more concrete evidence of good faith.

Again we find that the State Department of Public Health is interested in the practice of medicine by the private physician. There was, we are told, no urging of the druggists to send patients to the public clinics,—only the request to advise the patient to seek competent medical care. We say "again" because the Department consistently has provided services to make the treatment of gonorrhea and syphilis simpler and more effective in the doctor's office. The Wassermann and bacteriological laboratory service, the free distribution of arsenicals and silver nitrate, the frequent circularization of the entire profession with condensed texts upon the treatment of gonorrhea and syphilis, the distribution of information for the patient which upholds the physician in his insistence upon continued treatment after symptoms have disappeared,—all are directed toward keeping the treatment of these diseases where it belongs—in the doctor's office.

Now it behooves the physician to put his house in order. May he who is treating gonorrhea and syphilis according to the obsolete medical school instruction he was given years ago, stop, look and listen, for things are no longer as they used to be. Small credit to the profession if patients suffering with such prevalent and dangerous communicable diseases as these, should be sent by an honest druggist, coöperating with the State Department of Health, to a physician who thinks that gonorrhea is only a urethral discharge or that syphilis is a sore that can be diagnosed at a glance and cured with a salve! Let us bear honestly the responsibility which we insist is ours.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

HIGGINS, HAROLD L. A.B., M.D. Johns Hopkins 1919. Assistant Professor of Pediatrics, Harvard Medical School. Physician to Children's Medical Department, Massachusetts General Hospital. His subject is: "Some Physiological and Clinical Effects of High Fat Feeding." Page 145. Address: Massachusetts General Hospital, Boston.

BENEDICT, FRANCIS G. Ph.D., D.Sc. Director Nutrition Laboratory, Carnegie Institution of Washington, 29 Vila Street, Boston. His subject is: "A Helmet for Use in Clinical Studies of Gaseous Metabolism." Page 150. Address: 29 Vila Street, Boston.

MILLER, JAMES ALEXANDER. A.M., Sc.D., M.D. Columbia University College of Physicians and Surgeons, 1899. Professor of Clinical Medicine, Columbia University. His subject is: "Why Do So Many Die of Tuberculosis?" Page 158. Address: 133 East 64th Street, New York City.

DALRYMPLE, SIDNEY C. M.D. Bowdoin Medical School, 1917. Pathologist to the Newton Hospital, Waltham Hospital, Framingham Union Hospital, and Leonard Morse Hospital. Instructor in Pathology, Boston University School of Medicine. His subject is: "Thrombosis of the Interlobular Arteries of the Kidneys in Pregnancy." Page 160. Address: Newton Hospital, Newton, Mass.

ELEY, R. CANNON. M.D. University of Virginia 1925. Medical Resident, Neurological Service, Infants' and Children's Hospital, Boston. His subject is: "Neurological Complications of Whooping Cough." Page 162. Address: 300 Longwood Avenue, Boston.

WAKEFIELD, PAUL. Ph.B., A.M., M.D. Rush Medical College 1904. Chief of the Chadwick Clinics. Twenty-two years in Health work in China. Last ten years, Student Health Director, Central China University, Hankow. His subject is: "Children's Tuberculosis Program in Massachusetts." Page 168. Address: Room 6, State House, Boston.

BIGELOW, GEORGE H. A.B., M.D. Harvard 1916. Doctor of Public Health 1921; Commissioner of Public Health for Massachusetts. Address: State House, Boston, Massachusetts. Associated with him is:

NELSON, N. A. B.S., M.D. Long Island College Hospital, Brooklyn, New York 1926. Epidemiologist in Charge of Venereal Disease Control, Massachusetts Department of Public Health. Address: 546 State House, Boston. They write on: "The Support of the Druggist in the Control of Gonorrhea and Syphilis." Page 172.

THE BOSTON MEDICAL LIBRARY

THOMAS YOUNG, M.D., 1773-1829

"What one has done another can do."

WHATEVER disagreement there may be with the above quotation which was the motto of the subject of this sketch, the fact remains that in this particular instance the truth of the statement appears to have been demonstrated. The extraordinary intellectual precocity of Thomas Young, like that of many others who have distinguished themselves in various fields of human endeavor, doubtless provided a background for the fulfillment of the above pronouncement. It would appear, however, that the development of what is designated as evidence of precocity is not all to be ascribed to native disposition, but is to a very considerable extent the result of intelligent guidance of the young child during the formative period and an early recognition of its natural capabilities on the part of those to whom has been committed the direction of childhood training. As evidence of this truth, compare the early childhood of John Stuart Mill and von Helmholtz.

Thomas Young was born at Milverton, England on June 13, 1773. His parents were of the middle station in life and belonged to the Society of Quakers. Though in later life he did not continue to subscribe to Quaker tenets, nevertheless he was in the habit of attributing to his bringing up in that faith much of the perseverance and determination to succeed which characterized his entire career and constituted so large a part of the teaching which the Society of Friends inculcated in their disciples. He was the nephew of a celebrated London physician of that day, Dr. Richard Brockelsby, to whom he was indebted for advice and help in the pursuit of his education. His grandfather, with whom he lived for the first nine years of his life, was interested in the classics and took upon himself a good deal of responsibility in the development of the child. Among the methods employed in his early training, after he had learned to read, was the habit of committing poetry to memory and we have his grandfather's testimony that at six years he recited to him Goldsmith's Deserted Village with the omission of only one or two words, which the boy himself states in an autobiography, was a task occupying six weeks of his time when not in school. He began to read at the age of two. Besides these exercises in memorizing he became a consistent reader in the classics, philosophy and natural history and gained a considerable mastery of certain European languages and many of those of the Orient. He kept minute notes on all that he read including observations in botany, entomology, anatomy and medicine. He made the majority of these notes in Latin of which language and Greek he was recognized as having more than ordinary command when he was eighteen years of age.

When he was sixteen he had a long illness which was thought to be tuberculosis and it was at this time that he came under the observation of Dr. Brockelsby. Through this association he had, for many years thereafter, opportunity to meet a number of the more distinguished literary celebrities of the time while making his annual winter visits to his uncle. In 1792 he commenced the study of medicine under the tutelage of Matthew Baillie, William Cruickshank and John Hunter. He spent the year 1793 as a student at St. Bartholomew's Hospital in London. In the fall of 1794 he went to Edinburgh where he was enrolled as a medical student under Gregory Duncan and Black who were then the bright and particular stars in the teaching profession of that distinguished school. He had acquired a considerable scientific reputation for one so youthful and secured membership in the Royal Society in recognition of a paper he presented upon the cause of the accommodating power of the crystalline lens. Along with his medical studies in Edinburgh he applied himself to the study of German, Spanish and Italian. He appreciated the fact that "all work and no play makes Jack a dull boy" and mixed in society, dropping the outward indications of his Quaker upbringing and learned to dance, play the flute, and cultivated his voice in singing. In the fall of 1795 he went to Göttingen where he continued his medical studies and devoted considerable time to music, art and, for recreation, to horsemanship. In 1796, having passed the requisite examinations, he was created a Doctor of Physic. He took a walking trip through parts of Germany, spending considerable time at Dresden where he studied art, chiefly. Upon his return to London in the spring of 1798 following the advice of Dr. Brockelsby he became a "fellow-commoner" at Emmanuel College, Cambridge, where he continued to reside in term time, though the untimely death of his uncle made him heir to his house, pictures, library and ten thousand pounds. During this period of connection with Emmanuel College he gratified his interest in scientific investigation by prosecuting some research work in physics, which later formed the basis of his more important contributions to that science. A portion of the year 1799 he spent in attendance at the London Hospitals after which he entered seriously upon the practice of medicine at his uncle's old location. He evidently recognized, as did his friends also, that it would be very easy for him to become neglectful of his practice because of the lure which the field of pure science had for him. He occupied the Chair of Natural Philosophy at the Royal Institute from 1801-1803, resigning at the instigation of his friends. He had been a member of the Royal Society since 1794 and was appointed to the office of foreign Secretary, a position

which he held until his death. In March of 1803 he was granted a degree of M.B. and in July of the same year that of M.D. He acquired a house at Worthing, a fashionable watering place, in 1805 where he annually spent his summers until 1820. In 1809 he received the election to fellowship in the College of Physicians and was Croonian lecturer for 1822 and 1823. He lectured on medical science and the practice of physic at Middlesex Hospital from 1809-1813. In 1811 he was elected physician to St. George's Hospital retaining this position until his death, but he had retired from the active practice of his profession in 1814. His retirement from practice was apparently a concession to those preferences in scholarly pursuits which his varied experience had prompted. He was always of the opinion that success in the accomplishment of any thing was more to be credited to personal effort than to the assistance of advisers or instructors as he stated at one time in a letter to his brother. To quote from this letter he said, "it is in reality very little that a person who is seriously and industriously disposed to improve may not obtain from books with more advantage than from a living instructor; it must be the strength of the traveller and not the guide that must conquer the difficulties of the journey. Masters and mistresses are very necessary to compensate for want of inclination and exertion; but whoever would arrive at excellence must be self taught." It was too close an adherence to this principle which constituted the chief drawback to his success in certain lines where his influence might have been even greater, for example in some of the methods of imparting his knowledge through the several attempts which he made to teach. He did not maintain intimate enough contacts with other workers, less able and differently trained, to enable him to appreciate the difficulties in the acquisition of knowledge which seemed so easy for him. The rarity of good penmanship in these days indicates a failure on the part of present day educators to appreciate the value of training to this end in developing methods of accuracy in their work. To this accomplishment in Young is to be ascribed much of the accuracy of his classical knowledge. He was equally careful in the formation of letters of the Greek alphabet and much of his Greek prose composition was done with a meticulous attention to the formation of the letters. It was doubtless due to this, in no small measure, that his important discoveries in Egyptology in later life were due. At all institutions where the art of medical practice was taught much stress was laid upon natural philosophy and while he devoted such time as was necessary to the mastery of the strictly medical subjects, he busied himself with courses in the contributory sciences as well as in philosophy and history. It was during his studies at St. Bartholomew's Hospital that his knowledge of physics aroused interest in the anatomy of the crystalline lens and it was upon this subject that he wrote his first medical article. He interspersed travel trips between his various academic experiences and always on these occasions spent considerable time in the observation of industries as well as in the study of geology and botany in the regions traversed of which he made ample notes and from which he not infrequently made elaborations which were published in various secular and scientific journals. He profited much by his sojourn at Edinburgh for a winter and upon its completion he took a travel trip through the north of Scotland, the English Lakes and Wales ending up at Yarmouth whence he shipped for Hamburg. Here he found two German friends who had been fellow students at Edinburgh and proceeded to Göttingen and enrolled again as a medical student in October, 1795. Aside from the strictly medical lectures which he attended he studied the history and constitutions of the European States, the history of the ancient arts, and physics. Here as in Edinburgh he found time to make some observations upon the human voice as a result of his studies in physics and medicine. He also acquainted himself with the philosophy of Kant but his mind was too strongly English in its bent to win him over as a subscriber to the teachings of this school. He passed his examinations and received very favorable commendation for his thesis and was granted his degree in physic, after which he took an extended walking trip through Germany where he observed the manners and customs of the people and in letters and articles gave expression to his impressions of them and made comparisons of the national character and accomplishments that were extremely interesting because he probed deeply into the fundamentals of racial development. From here he returned to England and took up his residence in Cambridge there to obtain his degree of M.B. and M.D. at the end of another year. It was the rule at the Universities of Oxford and Cambridge at this period, with which there was no compromise except through a special dispensation of the Crown, that a candidate for the degrees in medicine must spend five years in residence for the first degree, that of Bachelor of Medicine, and six years for the second, Doctor of Medicine. These he obtained in the usual way, employing much of his time in studies, suggested undoubtedly by his interest in medicine, but belonging in the field of pure science. His principal contributions along these lines were concerned with the physics of sound and light and he was a pioneer in establishing the theory of the undulatory character of these phenomena. He was also keenly interested in the physics of the formation of dew and other matters that required meteorological knowledge. He served on the Board of Longitude and had much to do in correcting those dangerous errors which had been recorded in the nautical almanac. The behavior of the tides

and the causes for the same were made more understandable by his studies. The interference of sound and light waves, and the phenomena produced by these were two of his greatest scientific contributions. It would seem like a far cry from investigations along lines so distinctly physical as the above would indicate, to an investigation of Egyptian hieroglyphics and yet it was in this field that perhaps his greatest honors were won through his discovery of a clue to the translation of the inscriptions on the Rosetta stone.

Any one of these triumphs of his intellectual acumen was enough to have won for him a "place in the sun". The actual practice of his profession, in spite of all his efforts to the contrary, contributed less to his reputation than these other concerns unless one is permitted to allot his optical and acoustic discoveries to the science of medicine for it was doubtless through that channel of approach that the goal was achieved. How desirable it is for the average man to cultivate so highly a number of side issues may be questioned and certainly there may have been certain defects in this man's make-up which were the result of the extreme diversifications of his intellectual interests. The most glaring of these were failure to be able to express himself so as to impart his knowledge and the absence of a sympathetic appreciation of his patients' problems which prevented his being sought out as one of the more successful practitioners.

It is fair to conclude that the important factor in the success attained by Thomas Young was due to adherence to the sentiment expressed in the motto chosen for his guidance, which if generally adopted may be expected to produce a few phenomenal characters and many of more than average capacity and culture.

C. F. P.

MISCELLANY

MIRACLES AND MEDICINE*

A patient asked me, the other day, "Doctor, do you believe in miracles?" I smiled and said "Yes . . . and . . . no. . . . It all depends." And the patient remarked "Well, I think so too." What economy of words, and . . . thought! Later I opened my dictionary.

WHAT IS A MIRACLE?

The Standard Dictionary told me that "miracle" means: (1) "Any event apparently transcending the power of ordinary natural agencies; an event not attributable to known natural powers; (2) An event in the natural world but out of the established order, and possible only by the intervention and exertion of divine power."

*Interpretation of the Powers of Miracles by Dr. S. C. Allen, a Neurologist and Psychiatrist.

WHAT IS A RELIGIOUS MIRACLE?

As the latter is theologic, I referred to an authority in that field for a more complete definition. In Hodge's "Outline of Theology" a miracle is: (1) "An event occurring in the physical world, capable of being discerned and discriminated by the bodily senses of human witnesses, (2) of such character that it can be rationally referred to no other cause than the immediate volition of God, (3) accompanying a religious teacher, and designed to authenticate his divine commission and the truth of His message."

A GREAT CARDINAL ON MIRACLES

Then to Cardinal Newman and his very interesting religious autobiography, Apologia Pro Vita Sua:

"Now as to miracles. Catholics believe they happen in any age of the Church, though not for the same purposes, in the same number, or with the same evidence as in apostolic times. . . . Since generally they are granted to faith and prayer, therefore in a country in which faith and prayer abound, they will be more likely to occur than where and when faith and prayer are not; so that their occurrence is irregular. And further, as faith and prayer obtain miracles, so still more commonly do they gain from above the ordinary interventions of Providence; and, as it is often very difficult to distinguish between Providence and a miracle, and there will be more providences than miracles; hence it will happen that many occurrences will be called miraculous, which, strictly speaking, are not such, and not more than providential 'graces.'"

EVIDENCE CARDINAL REQUIRES

The Cardinal continues: "Persons who believe all this in accordance with Catholic teachings, as I did and do, they, on the report of a miracle, will of necessity, and the necessity of good logic, be led to say, first, 'It may be,' and secondly, 'but I must have good evidence in order to believe.' It may be, because miracles take place in all ages; it must be clearly proved, because after all it may be only providential mercy, or an exaggeration, or a mistake, or an imposture. . . ."

The natural tendency of his mind is often spoken of as skeptical. He held that, apart from an interior and unreasoned conviction, there is no cogent proof of God. He had the necessary interior conviction. But so far as the rest of the world is concerned, his teachings amount to this: that the man who has not this interior conviction has no choice but to remain an agnostic, while the man who has it is bound to sooner or later become a Roman Catholic.

SIR OLIVER LODGE'S BELIEFS

In this connection it is interesting to note the belief of a recognized great English scientist, Sir Oliver Lodge, that life cannot be explained by force. "Life may be something immaterial, something outside our present categories of matter and energy, as real as they are, but different, and utilizing them for its own purpose."

I then consulted critical minds, both in and out of the church, who had labored with the problem. For example . . . but I had better let these men talk for themselves:

JOHN STUART MILL ON MIRACLES

John Stuart Mill, English philosopher and economist, says: "To constitute a miracle, a phenomenon must take place without having been preceded by any antecedent phenomenal conditions sufficient again to reproduce it. . . . The test of a miracle is, were there present in the case such external conditions, such secondary causes, we may call them, that whenever these conditions or causes reappear, the event will be reproduced? If there were, it is not a miracle; if there were not, it is."

SPINOZA, EINSTEIN, AND MIRACLES

When the existence of God is denied (atheism), or His nature is declared to be unknowable (agnosticism), or He is identified with nature itself (pantheism), or He is so distinguished from the world that His action is excluded from the course of nature (deism), miracle is necessarily denied. Thus Spinoza (and Einstein), identifying God and nature, declares that "nothing happens in nature which is in contradiction with its universal laws." It is only the theistic view of God as personal power—that is, as free will—ever present and ever active in the world, which leaves room for miracles.

HUXLEY VERSUS HUME

Thomas Henry Huxley, the English biologist (with Charles Darwin, author of "Theory of Evolution," probably the leading scientists of the nineteenth century), was a Fellow of the Royal College of Surgeons, a geologist, and a naturalist. He served on ten Royal Commissions, dealing in every case with subjects of great importance, in many, of the gravest moment to the community. He held and filled with invariable dignity and distinction more public positions than have, perhaps, ever fallen to the lot of a scientific man in England. He had not the smallest respect for authority as a basis for belief, scientific or otherwise.

HUXLEY, MIRACLES, AND PRAYER

Hume, the English philosopher, had defined a miracle as "a violation of the law of nature." Huxley refused to accept this. He asserts that "the conception of the constancy of the order of nature has become the dominant idea of modern thought. . . . Whatever may be man's speculative doctrines, it is quite certain that every intelligent person guides his life and risks his fortune upon the belief that the order of nature is constant, and that the chain of natural causation is never broken." He adds, however, "It by no means necessarily follows that we are justified in expanding this generalization into the infinite past." While, on the one hand, he insists that "the whole fabric of practical life is built upon our faith in its continuity," on the other hand, "nobody can presume to say what the order of nature must be"; this "knocks the bottom out of all *a priori* objections either to ordinary 'miracles' or to the efficacy of prayer."

"If, by the term 'miracles,' we mean extremely wonderful events, there can be no just ground for denying the possibility of that occurrence." Assuming the chemical elements to be aggregates of uniform primitive matter, he saw no more theoretical difficulty in water's being turned to alcohol in the miracle at Cana, than in sugar undergoing a similar conversion. The credibility of miracles with Huxley is a question of evidence. He was cautious in expressing himself, when others so often confidently denied the possibility of miracles: "If a dead man did come to life, the fact would be evidence, not that any law of nature had been violated, but that these laws, even when they express the results of a very long and uniform experience, are necessarily based on incomplete knowledge, and are to be held only on grounds of more or less justifiable expectation."

"It may be remarked that a scientific explanation is destructive of the supernatural character of a miracle, and that the demand for evidence may be so framed, and conditioned, as to preclude the credibility of *any historical event*."

HUME ON MIRACLES

David Hume, English philosopher, historian, and political economist, in his essay, "On Miracles," has been the standard authority of those denying the occurrence of miracles. Regardless of one's views, it is a remarkable document. Quoting does it an injustice. It will well repay reading. It is interesting, for in his own lifetime there occurred, in the city of Paris, a series of miracles, in which he could put his theories to the test. In the cemetery of St. Medard, in Paris, was buried a young Jansenist deacon, of singularly holy life, Francois de Paris. All sorts of miraculous cures were reported to have been worked at his tomb.

HUME AND PRIEST'S TOMB

Quoting Hume: "There surely never was a greater number of miracles ascribed to one person than those which were lately said to have been wrought in France upon the tomb of Abbé Paris, the famous Jansenist, with whose sanctity the people were so long deluded. The curing of the sick, giving hearing to the deaf and sight to the blind, were everywhere talked of as the usual effects of the holy sepulchre. But what is more extraordinary, many of the miracles were immediately proved on the spot, before judges of unquestioned integrity, attested by witnesses of credit and distinction, in a learned age, and on the most eminent theatre that is now in the world. Nor is that all; a relation of them was published and dispersed everywhere; nor were learned bodies, supported by the civil magistrates and determined enemies to those opinions in whose favour the miracles were said to have been wrought, ever able to distinctly refute them. Where shall we find such a number of circumstances agreeing to the corroboration of one fact?" (These occurred about 1737.)

THROUGH BOOK TO DUNGEON

The evidence Hume quotes is from a book about which he remarks: "This book was writ by Mons. Montgeron, counsellor or judge of the parliament of

Paris, a man of figure and character, who also was a martyr to the cause, and is now said to be somewhere in a dungeon on account of his book." "Many of the miracles of Abbé Paris were proved immediately, by witnesses before the officiality or bishop's court, at Paris, under the eye of Cardinal Noailles, whose character for integrity and capacity was never contested even by his enemies." "His successor in the archbishopric was an enemy of the Jansenists, and for that reason promoted to the See, by the Court. Yet twenty-two rectors of Paris with infinite earnestness press him to examine the miracles, which they assert to be known to the whole world and indisputably certain; but he wisely forbore."

POLITICS VERSUS MIRACLES

The political party in control "tried to discredit these witnesses. . . . But, besides that their proceedings were in many respects the most irregular in the world, particularly in citing only a few of the Jansenist witnesses, whom they tampered with; besides this . . . they soon found themselves overwhelmed by a cloud of new witnesses, one hundred and twenty of them, most of them persons of credit and substance in Paris, who gave credit for the miracle."

FRENCH POLICE INVESTIGATE

"All who have been in France about that time have heard of the reputation of Mons. Herault, the Lieutenant of Police, whose vigilance, penetration, activity, and extensive intelligence have been much talked of. This magistrate, who by the nature of his office is almost absolute, was invested with full powers, on purpose to suppress or discredit these miracles, and he frequently seized immediately, and examined, witnesses and subjects of them, but never could reach anything satisfactory against them."

MLLE. THIBAUT VERSUS DE SYLVA, M.D.

"In the Case of Mademoiselle Thibaut, he sent the famous De Sylva to examine her, whose evidence is very curious. The physician declares that it was impossible she could have been so ill as proved by witnesses, because it was impossible she could, in so short a time, have recovered so perfectly as he found her. He reasoned, like a man of sense, from natural causes; but the opposite party told him that the whole was a miracle, and that his evidence was the very best proof of it." The party in power "were in a sad dilemma. They durst not assert the absolute insufficiency of human evidence to prove a miracle. They were obliged to say that these miracles were wrought by witchcraft and the devil."

KING AND QUEEN FOILED

In one instance the "Queen Regent of France, who was extremely prejudiced, . . . sent her own physician to examine the miracle, who returned, an absolute convert. . . ." "Had it been a cheat, it had certainly been detected by such sagacious and powerful antagonists." "The church yard was shut by the king's edict."

Hume says: "And what have we to oppose to such a cloud of witnesses but the absolute impossibility or miraculous nature of the events of which they relate?"

MACAULAY VERSUS HUME

Those who fear being convinced by a reading of Hume will be doubly warned by the following estimate of this great man by that notable English historian and essayist, Macaulay: "Hume is an accomplished advocate. . . . Everything that is offered on the other side is scrutinized with the utmost severity; every suspicious circumstance is ground for argument and invective; what cannot be denied is extenuated, or passed by without notice; concessions are even sometimes made; but this insidious candour only increases the effect of the vast mass of sophistry."

ALIAS "FUNCTIONAL DISEASE"

Many physicians when confronted with evidence of real cures through "faith," remark, "Well it was only a functional disease." A functional disease, according to the medical dictionary, is a disease manifested by disorder in the functions of the several organs or tissues, but in which no lesion or change in structure can be determined. A striking example would be the paralysis of a limb in a person who, on superficial examination, may or may not seem hysterical; with bone, muscle, tendon, blood vessels, and nerves, seemingly unchanged, yet the patient is crippled. For practical purposes, the cripple uses the same kind of crutch, whether or not the disease is called "functional".

The opinions of medical authorities on "functional diseases" and their cure is interesting:

NEUROLOGIC SOCIETY HEAD ADMITS CURES

FRANCIS X. DERCUM, A.M., M.D., Ph.D., Professor of Nervous and Mental Diseases, Jefferson Medical College, Philadelphia, Ex-President of American Neurological Society, Member of the Neurological Societies of Paris, Vienna, etc., Neurologist, Philadelphia General Hospital, states: "In the faith cure the essential feature is the suggestion to the patient, or by the patient himself, of the absence of various symptoms which he presents." The technical name, rather forbidding, is "negative hallucination". "That powerful results . . . can . . . be induced . . . we have already seen." "Numerous cases of striking results achieved by faith . . . are upon record . . . deafness, dumbness, traumatic paralysis. . . ."

PSYCHOLOGISTS AND CURED CRIPPLES

PIERRE JANET, M.D., Professor of Psychology in the College de France, Director of the Psychological Laboratory in the Clinic of the Saltpetriere, in his lectures on hysteria, a functional disease, given by invitation at Harvard Medical School, says: "The production of a contracture requires . . . some emotion. . . . It is the same with the cure of these contractures; in certain cases they persist indefinitely. I have two cases which lasted for thirty years. In other cases, they are suddenly cured through influences that are incomprehensible, if one does not take into account imagination and emotion."

"These diseases are among those which make the fortune of religious relics and miraculous springs. When you hear a story about a cripple with hard, shrivelled legs and twisted body, who rolled to the spring in a low carriage, and got up again, bearing away his carriage on his shoulders, you need not have the least hesitation in pronouncing the case one of hysteric contractures." ". . . I recommend you to read the admirable book of Carre de Montgeron on the miracles wrought in the cemetery of Saint Medard on the tomb of Deacon Paris, 1737."

SACRED SPOT AND PROFESSOR OF PSYCHIATRY

SMITH ELY JELLIFFE, M.D., Ph.D., formerly Professor of Psychiatry, Fordham University, formerly Professor of Diseases of Mind and Nervous System, New York Post Graduate School and Hospital, editor of the Journal of Nervous and Mental Diseases, referring to the treatment of the functional disease, hysteria, says: "Its dynamic nature, as that is understood today, explains also the method of sensational, miraculous cure which has not yet passed out of possibility. Anything that will slowly or suddenly alter the form of the striving for the active cravings and, through confidence ('faith'), open the personality into outgoing channels, such as a trusted or loved object offers to every human being, can make an occasion for a cure."

". . . Suggestion, the presence of a 'divine' person or a sacred spot, or the sudden event . . . are all only opportunities for this personality to assert itself in new ways, which better fit the demands of the real world upon the personality."

A DANGER IN CURES

"There exists a danger in all these methods. . . . A seeming cure may be effected in regard to a portion of the personality . . . with later new symptoms or groups of symptoms. This is particularly evidenced in 'brutality' or 'third degree' methods. . . . These medieval and barbaric ways of 'chasing the devil' out of the patient by command, harshness, vile medicine, electrical tortures, etc. . . . really do not cure the patient; they drive the disorder into other more settled forms. They are stupid procedures, emanating from stupid and cruel personalities."

OSLER ON CONFESSION AND MIRACLES

SIR WILLIAM OSLER, Bt., M.D., F.R.S., Fellow of the Royal College of Physicians, Professor at Oxford University, Johns Hopkins University, etc., whose text book, "Practice of Medicine," is one of the most widely used books in medical schools and whose biography by Harvey Cushing, famed in brain surgery, Professor of Surgery at Harvard, received the Pulitzer Prize, discussing certain functional diseases, says: "The use of religious ideas and practices has come into vogue in various forms, as Christian Science, Mental Healing, etc. It is an old story. In all ages, and in all lands, the 'prayer of faith,' to use the words of St. James, has healed the sick; and we must remember that amid the Aesculapian cult, the most elaborate and beautiful system of faith healing the world has seen, scientific medicine took its rise. As a profession, consciously or unconsciously, more often the latter, faith has been one of the most valuable assets, and Galen expressed a great truth when he said, 'He cures most successfully in whom the people have the greatest confidence.' It is in these cases of neurasthenia, psychasthenia, the weak brothers, and weaker sisters, that the personal character of the physician comes into play, and once let him gain the confidence of the patient, he can work the same miracles as Our Lady of Lourdes, or Ste. Anne de Beaupre. Three elements are necessary: first, a strong personality in whom the individual has faith: Christ, Buddha, Aesculapius (in the days of Greece), one of the saints, or what has served the common humanity very well, a physician; secondly, certain accessories: a shrine, a sanctuary, the services of a temple, or for us, a hospital or its equivalent, with a skillful nurse; thirdly, suggestion, either of the 'only believe,' 'feel it,' 'will it' attitude of mind, which is the essence of every cult and creed, or the active belief in the assurance of the physician that health is within reach." ". . . Giving vent to one's secrets and confessions are well known abreactions."

CROWD PSYCHOLOGY AND JESUS

The suggestibility of large crowds is markedly greater than that of individuals, and to this and the greater faith must be attributed the greater successes of the fashionable places of pilgrimage. The Bible student will recall a confirmation of this from the Bible. Two notable cures are credited to Jesus, on the western side of the lake. In each of these cures prominence is given to the requirement and reward of faith—that is to say, of personal confidence in the Healer: "Thy faith hath made thee whole," and, "Fear not, only believe." After this, Jesus passed away from the enthusiastic crowd by the lake to visit His own little town, Nazareth, and to find there a natural incredulity in regard to one whom they knew as the carpenter. Once more we come across a mysterious limitation of His powers: "He could not do there any miracle" save the cure of a few sick, and he marvelled because of their want of faith.

"FUNCTIONAL DISEASE"—NEGLECTED ORPHAN

MORTON PRINCE, A.B., M.D., LL.D., Professor Emeritus of Nervous Diseases, Tufts College Medical School, Professor of Abnormal and Dynamic Psychology, Harvard University, whose contributions to science are noted in the Encyclopedia Britannica, wrote a paper, not long ago, on the need for instruction in functional diseases in medical schools:

"It is curious that few, if any, medical schools include systematic instruction in the functional diseases in their curriculum. . . . It has been estimated that from 50% to 75% of the cases that the general practitioner meets are of this class and they include nearly every form of bodily and mental disturbances, of major and minor degree. Indeed the symptoms of nearly every organic disease, barring infectious diseases, may be mimicked by a purely functional disease." . . .

"Of course, within certain limits, in each branch of organic medicine, the functional disturbances, as of the heart and lungs, is dwelt upon to a greater or lesser extent, but the systematic instruction in the functional disturbances of the whole organism, it must be recognized, is entirely neglected."

"ONLY" A FUNCTIONAL DISEASE

"The organic diseases that may be mimicked may be those of the heart, lungs, the gastro-intestinal tract, kidneys, and even tumors of the brain and the abdomen. Diabetes, Bright's disease, asthma, and hay-fever are frequently mimicked. In the surgical field the various joint diseases of the spine and limbs, including even atrophy of the muscles, are classically known to be imitated by functional diseases, and pseudo-appendicitis of a neurotic character is quite common. Many are the cases of such neurosis, mistakenly diagnosed as true appendicitis, that have been operated upon, only to find a normal appendix; and the same is true of other organs. In the nervous system, every sort of organic disease may be mimicked. Even functional epilepsy occurs and may be very difficult to distinguish from true epilepsy. The examples of functional diseases of all the various organs of the body mimicking true organic disease that I have seen in the course of a long period of general and neurological practice . . . have been many." . . .

"Then we have the great field of the psychoneuroses, in which are included so-called traumatic neuroses, "shell-shock," neurasthenia, hysteria, and psychasthenia expressing themselves in . . . inability to adapt to the environment and demands of life."

"Again there are the multiform heterogeneous disturbances of functions without name, which every practitioner meets in practice. Many of these are of minor character, it is true; but they are incapacitating just the same."

THE HARVARD PROFESSOR'S SECRET

"Pain of various kinds, imitating that of organic disease but of purely functional character, is particularly common and misleading. The same is true of digestive and intestinal disturbances. A former professor of the Harvard Medical School who specialized in the field, and had an enormous practice, admitted to me after several years of experience, that 95% of his patients suffered from purely functional disturbances of the gastro-intestinal tract." . . .

"All these functional disturbances have proved a gold mine to . . . so-called practitioners of the irregular schools." . . .

TOO LATE—TOO LATE

"Many are the cases which have been treated with drugs and other forms of physical therapy, and banal advice without, of course, the slightest beneficial results when a real understanding of the case, and the proper therapy needed, would have easily restored the patient to health. And too often it is only after their bank accounts have dwindled to nothing, and they have become incapacitated for their life's occupation that they have turned at last to the specialist." . . .

FATHER POWERS—"FEELING BETTER"

I have studied carefully the cases of several individuals alleged to have been "miraculously" cured at the grave of Father Powers, at the Holy Cross Cemetery in Malden. I satisfied myself that striking recoveries were effected. When one notes the occasional striking cure, one cannot logically deny the possibility of an improvement of lesser degree. When, therefore, a faithful pilgrim reports "feeling better," there may be no occasion for sophisticated indulgent smiling.

NEGATIVE EVIDENCE

On the other hand there is offered as proof against any "cures", the evidence of "an exaggeration, or a mistake, or an imposture." This possibility is admitted in fact, in the very language quoted above, by Cardinal Newman. But such cases are negative evidence and do not contradict actual "cures".

Even in the field of science one finds occasional faulty use of negative evidence. In general paralysis of the insane, not a rare disease, it had been long suspected that the brain was affected by the germ or spirochete of syphilis. Scientists, the world over, had trained their microscopes on the brains of victims dead of this dread disease, without result. At such a time it was not difficult to find an individual who was quite positive the spirochete was not present in the brain. He could offer the evidence of all the most eminent that they had examined, by all the known methods of science, and had not found it. Then up spoke a little Jap, "I have found the spirochete in the brain." Not only did he assert, but he showed others how they themselves could see. The negative evidence of four dozen or four thousand who failed to see carries no weight against one Noguchi, who succeeded in seeing, and proved it.

MORE NEGATIVE EVIDENCE

A few years ago, I worked under a neurologist and psychiatrist, who, for almost forty years, had been developing and testing an idea. He was a poor, modest, devout Catholic of Vienna. I heard his wife complain of their genteel poverty. While he labored, generation after generation of physicians had been taught that general paralysis of the insane was incurable. Treatment after treatment had failed. A hundred thousand brains, rotting in asylums, a hundred thousand graves noisily and mutely testified to its incurability. One day, I congratulated my chief. His treatment, which actually stays the course of general paralysis of the insane, had won for him the Nobel Prize. The negative evidence of all the failures carries no weight in judging the successful Wagner-Jauregg.

FAITH AND ORGANIC DISEASE

As to the value of faith as an aid to medicine in the cure of diseases that are not functional, one

need not quote all the great men in medicine from Galen to Osler. One need only refer to one's family physician in his handling, let us say, of some acute infectious disease. He values the cheerful optimism of the helpful nurse and deplores that of the depressing. In a critical stage, with the flame of life burning low, all done that medicine can do, he does not ignore the value of faith and hope. He cannot measure its value as he would a drug, but he knows that in many such cases, his mere unspoken expression of despair, read by the patient, might snuff out that patient's life; whereas, his confidence, caught by the patient, and, through faith in him, become hope, may win the fight. In these two situations, the patients have each received all the benefits of medicine, yet, . . . one dies . . . one lives. So that, in these two similar cases, faith or lack of faith must be considered the deciding influence between life and death.

HOW MIRACLES WORK

How this miracle is wrought; how the emotions can affect the health; how certain mental conditions affect certain glands of the body, so that they vary the substances poured into the blood stream; how these in turn affect health; these are among the problems now being studied by men in different fields of science, such, for example, as Alfred Adler of Vienna, the psychologist, and Professor Cannon of Harvard, the physiologist. And the farther the trail is followed, the more miraculous the wonders that come to view.

USELESS ADVICE

Folks remark, "These people visiting shrines could be very well cared for by physicians." Most physicians would admit that, even with the wonderful hospitals existing today, their staffs might be hard put to make the painstaking studies and treat effectively all the persons suffering from functional diseases. In the *Journal of Medicine and Surgery*, the Chief of Social Service of one of the best hospitals in Boston (a city seemingly well supplied with hospitals) writes, referring to just one group of functional diseases: "Increased facilities for medical care of these cases is the obvious conclusion, and physicians have clamored for hospitals. . . ."

WHEN MIRACLE FAILS

As to being treated privately, the patient might, if well informed, visit some neurologist and psychiatrist. Most cases require a thorough medical examination as part of the specialist's examination and a sympathetic, psychologic study and treatment of the whole individual. If the specialist is a very busy man, he cannot devote the time and energy often required to effect a cure.

PHYSICIANS AT SHRINE

Most of the sick who visit a shrine to obtain a cure have had the benefit of a recent medical examination. But there are many who have not been so favored, or who have not had the advantage of a specialist's examination that their case may need. To help these, it would seem a work of charity to provide, as I am told is done at Ste. Anne de Beaupre, a preliminary medical examination. With such an arrangement the patient might avoid neglecting some condition that might very well be helped by medical science. There would be no weakening of faith. Medical science is not all powerful. Medical examinations should be in charge of physicians who have a sympathetic understanding of human nature. Such men know the value of faith in aiding cures. Wisely, they will not, in their medical ministrations, weaken the faith of the patient without supplying a better substitute. Such physicians, at the same time, will not let the patient's faith neglect the aid that answers the scientific prayers of physicians, pharmacist, hospital, and nurse.

NO CONFLICT

With the great men of science admitting there is no incompatibility between science and the essentials of religion; with the leaders in medicine admitting the power of faith to effect particular cures; with the great Huxley, cautious, not denying the possibility of miracles, but calling for the evidence; with Cardinal Newman, also, requiring for belief "good evidence," it seems there is no conflict between miracles and medicine. To believe or not believe in miracles is a matter of definition and evidence.

A STUDY OF THE VALUE OF POLIOMYELITIS SERUM

A special committee which has been appointed by the New York Academy of Medicine will make a study of the value of poliomyelitis serum in the preparalytic state of anterior poliomyelitis.

The members of the committee are Dr. Royal S. Haynes, Dr. George Draper, Dr. W. Lloyd Aycock, Dr. William H. Park, Dr. Simon Flexner, Dr. Josephine B. Neal, Dr. Philip van Ingen, Dr. Harold L. Amoss, Dr. Linsly R. Williams and Dr. E. H. L. Corwin.

A group of physicians will answer calls, do lumbar punctures and administer serum to preparalytic cases and members of the Meningitis Division of the Health Department will act as consultants on application by physicians. Untreated cases will be used as controls.

The Willard Parker Hospital desires the admission of bulbar cases in order to apply special treatment with the hope of helping these desperately ill patients.

ALCOHOL AS MEDICINE

Publicity has been given to an alleged statement by Dr. Richard Cabot to the effect that "there is no need for the use of alcohol in medicine".

This statement is reported to have been made in response to the request of Mrs. R. C. Winter, Secretary of the Cambridge Enforcement League. Dr. Cabot is reported to have emphasized this statement

by an endorsement of prohibition. We feel that the unqualified condemnation of alcohol as a medicine is not logical or strictly in accord with the evidence. It should be borne in mind that alcohol has been given recognition as a therapeutic agent by a considerable proportion of the medical profession. A public statement of this character could with propriety extend the courtesy of acknowledging a difference of opinion among physicians. We refrain from a discussion of the prohibition law.

RÉSUMÉ OF COMMUNICABLE DISEASES IN MASSACHUSETTS, JUNE, 1930

GENERAL PREVALENCE

The total number of cases of communicable diseases reported during June was slightly in excess of the total number reported for last year, due largely to the increased prevalence of measles and German measles.

The lower incidence of diphtheria noted in the previous month was continued during June, with fewer cases reported than for the corresponding month in any previous year. The reported incidence of typhoid fever was also distinctly low, equalling the previous low June record established in 1927. Anterior poliomyelitis, influenza and non-pulmonary tuberculosis were similarly less prevalent than in previous years.

The reported incidence of scarlet fever, diphtheria, pulmonary tuberculosis and whooping cough was within endemic limits. Epidemic meningitis, which has been unduly prevalent throughout the winter, fell to within "normal" limits. Chickenpox and mumps were likewise reported with normal frequency.

Measles and German measles were the only diseases which were unduly prevalent for this season of year, continuing the wave which has persisted for several months in the Metropolitan area.

The reporting of gonorrhea and syphilis continued to be considerably improved over that in previous years.

RARE DISEASES

Anterior Poliomyelitis was reported from Arlington, 1; Beverly, 2; total, 3.

Anthrax was reported from Lynn, 1; total, 1.

Dysentery was reported from Chelsea, 1; total, 1.

Encephalitis lethargica was reported from Boston, 1; Plymouth, 1; Westfield, 1; total, 3.

Epidemic cerebrospinal meningitis was reported from Beverly, 1; Boston, 3; Fitchburg, 1; Gardner, 1; Holyoke, 1; Lawrence, 2; Leominster, 1; Northbridge, 1; Quincy, 1; Worcester, 4; total, 16.

Malaria was reported from Chelsea, 7; total, 7.

Pellagra was reported from Boston, 2; total, 2.

Septic sore throat was reported from Belmont, 1; Beverly, 1; Boston, 6; Braintree, 1; Brookline, 1; Marlboro, 1; Shirley, 7; Westboro, 1; total, 19.

Tetanus was reported from Beverly, 1; Natick, 1; New Bedford, 2; total, 4.

Trachoma was reported from Boston, 2; Everett, 1; Springfield, 1; total, 4.

Trichinosis was reported from Fall River, 3; total, 3.

MONTHLY REPORT OF CERTAIN COMMUNICABLE DISEASES

	Cases in Entire Population				Case Rates per 100,000 Pop.		
	June 1930	June 1929	Prosodemic Index	Epidemic Index	June 1930	June 1929	Expected Rate***
ALL CAUSES	10,485	7,514	—	—	236.4	171.5	—
Ant. Poliomyelitis	3	4	8*	.4**	.1	.1	.2
Diphtheria	203	270	265*	.8**	4.6	6.2	6.0
Ep. c. s. meningitis	16	19	10*	1.6**	.4	.4	.2
Measles	4227	2142	4792*	.9**	95.3	48.9	108.0
Pneumonia, Lobar	254	214	221*	1.1**	5.7	4.9	5.0
Scarlet Fever	603	648	811*	.7**	13.6	14.8	18.3
Tuberculosis, Pul.	432	364	479*	.9**	9.7	8.3	10.8
Typhoid Fever	17	22	18*	.9**	.4	.5	.4
Whooping Cough	773	728	823*	.9**	17.4	16.6	18.6
Chicken Pox	876	958	—	—	19.7	21.9	—
German Measles	820	126	—	—	18.5	2.9	—
Gonorrhea	568	376	—	—	12.8	8.6	—
Influenza	8	7	—	—	.2	.2	—
Mumps	454	429	—	—	10.2	9.8	—
Syphilis	305	140	—	—	6.9	3.2	—
Tuberculosis, O. F.	60	75	—	—	1.4	1.7	—

*This Index is an attempt to estimate the number of cases based on the trend during the past years which can be expected to occur, and is for the purpose of comparison with the number of cases which actually did occur.

**This ratio expresses how prevalent the disease is compared with the index mentioned above; 1.0 indicates that the actual number of cases equals the expected number. A larger number means a greater prevalence, and a smaller number a lesser prevalence than expected. Thus, 2.0 would indicate twice the expected number of cases, and .5 half the expected number of cases. The method used to determine the indices is described in the August 18, 1927 issue of the *Boston Medical and Surgical Journal*.

***Calculated from the Prosodemic Index.

DR. S. S. ACKERLY WILL JOIN THE YALE FACULTY

Dr. Samuel Spafford Ackerly who has been clinical director at the Worcester State Hospital for four years has accepted appointment on the faculty of Yale University. His especial work will be in the Institute of Human Relations which is being carried on under specific grants to the University.

Dr. Ackerly has been especially interested in the problems of child guidance.

PSITTACOSIS MAY BE MORE COMMON THAN GENERALLY SUPPOSED

Dr. L. F. Badger of the U. S. P. H. Service has expressed the opinion that psittacosis is more common than has been recognized and cites cases occurring among affected employees who apparently had the characteristic symptoms but were not diagnosed.

In addition to parrots, parrakeets seem to have been the cause of the disease in numerous instances.

CORRESPONDENCE

A DISCUSSION OF CERTAIN REPORTS APPEARING IN THE RECORDS OF THE PROCEEDINGS OF THE COUNCIL OF THE MASSACHUSETTS MEDICAL SOCIETY

July 16, 1930.

New England Journal of Medicine,
165 Newbury Street,
Boston, Massachusetts.

Mr. Editor:

I have just finished the reading of the proceedings of the Council in your *Journal*. My understanding is that it was voted to invite criticism, unqualified criticism, for the good of the medical profession.

My first desire is to command the sound judicial attitude of the Committee on Ethics and Discipline, an attitude which takes the position of making no decision until all the evidence is at hand. In a résumé by the chairman, the statement is made that the committee has been struggling with the question of advertising this year as always, and that it is a very difficult problem.

This is something that I cannot understand. When the properly delegated authority of organized medicine in Massachusetts and I went into conference on the matter, we found no such difficulty. One of his first remarks was, "The trouble with all these kickers, Dr. Hurley, is that they have not made a study of medical Ethics the way you and I have for the last twenty years." That remark was the truth. No physician who has the interest of the profession at heart would countenance for one moment anything in the nature of illegitimate advertising, but equally, he should not allow himself to get into that state of mind, where he substitutes maudlin sentimentality for ethics.

My first piece of constructive criticism would be to ask the Committee on Ethics and Discipline to sit down and reread the Code of Ethics of the American Medical Association, through that section which specifically sanctions the insertion of a professional card in the public press.

This privilege has always existed, and its exercise has been common custom throughout the world. That it has never been exercised in Boston in the English press, is wholly due to the fact that it was never considered necessary, until that unholy thing called Corporate Medicine appeared. I learned my medical ethics in the home of ethics, the city of Vienna, and had an extensive experience in the private practice of its leading practitioners. I am often amused to think of how these super ethicists in this country would hold up their hands in holy horror, if they could see the office sign of Hofrat Professor Adam Politzer, in size four feet by three, visible two hundred yards away, carrying his complete biography. Similar signs were the common property of medicine's leaders.

Why should the Committee find difficulty where none exists?

When I turn to the report of the Committee on Clinics, Health Associations and Industrial Clinics, I find the thing so loaded with fallacy that I hardly know where to begin.

The one bright spot in the situation seems to be Dr. Mongan's motion to defer consideration until the October meeting. I believe that the medical profession owes a debt of gratitude to Dr. Mongan, which cannot be measured in words, because his motion has saved it from irreparable injury, and has saved the Massachusetts Medical Society from making a fool of itself. The Society has an official attorney and he really ought to be making the following statement instead of me.

The subject matter of this report is something which lies beyond the jurisdiction of the Massachusetts Medical Society, all authority in the matter residing in the sovereign State of Massachusetts. As I pointed out in my February communication to this *Journal*, Corporate Medicine is a violation of the medical practice act. If the people do not like this law, they have constitutional means of changing it. Until they do change it, it stands. I am well aware that the sponsors of Corporate Medicine consider this as an academic point and also consider themselves above the law, as did the gentleman who tried to buck the Rhode Island authorities. It is this very frame of mind which has caused President Hoover to say that there is a growing disrespect for all laws.

With these facts in mind, does this committee seriously propose that the Massachusetts Medical Society go into a huddle with a crowd of law breakers, for the purpose of effecting a compromise, and thus make itself an accessory after the fact to a criminal offense?

The man who is in the right never needs a compromise; the man who is in the wrong always seeks a parley. Does this committee seriously propose that Corporate Medicine adopt a code of ethics? If so,

the proposal comes at the exact moment when Corporate Medicine has been officially condemned by the President-elect of the American Medical Association. What is he going to be accused of? When I denounced it I was accused of not knowing the difference between a profession and a trade, although I do, and know that corporation and trade are synonymous ideas; was accused of not knowing what noblesse oblige was, although I do, and know it is an interior something which is not based upon a broken contract and a violated state law.

It would be a most welcome change for me if the President-elect and I were both accused of being right, with the priority resting with me by seven years. It is rather late in the day for Corporate Medicine to discover that there is such a thing as honor. The whole thing reeks so of dishonor, that it is marvelous that any honest man in the medical profession could have been found willing to support it. The only code of ethics it can adopt is to shut up shop and get out of business, before the authorities put it out, as they did in Rhode Island.

One of the fallacies connected with it, starts with the truism that the public always gets what it wants. That is true, but there is no evidence at hand that it wants this proposition. The trouble is that its sponsors are suffering from auditory hallucinations. Every time they open their mouths on the subject they make a noise which they mistake for the roar of the crowd. As a matter of fact, the other four million people of Massachusetts are deaf and dumb on the proposition.

I do not want a single member of the medical profession to misconstrue my motives. I am not stimulated by the desire for personal publicity or financial gain, if I were I would not be in the profession. What I do want to bring home to everyone is the fact that the science of ethics is nothing but the science of straight shooting, and that certain forces in the profession are badly in need of target practice.

Under all the acerbity which goes with argument, I have a distinct love and respect for each man in the profession, and am always ready to give or take the blow which comes with the heat and burden of the day.

In the future, as in the past, whenever vexatious problems of ethics and economics arise, I am always at the service of the Massachusetts Medical Society, if only for the sake of auld lang syne.

Yours sincerely,

JOHN J. HURLEY, M.D.

466 Commonwealth Avenue, Boston.

RECENT DEATHS

SWIFT—DR. ROBERT SWIFT died at Roslindale, July 18, 1930, aged 71. He was the son of General John L. Swift, formerly of Boston, and was born in Roxbury, January 21, 1859. He was educated in a Roxbury grammar school, Roxbury Latin, English High and Harvard Scientific School, from which he was graduated in 1881 with the degree of S.B. His M.D. was from the Harvard Medical School in 1885. After two years' service at the Rhode Island Hospital in Providence, three years at the Boston Lunatic Hospital, a year spent in travel and two years of practice in Tennessee, Dr. Swift returned to Roslindale and had practiced there ever since. He leaves his wife, Mrs. Marie Asmud Swift, and a son. He was a member of the Massachusetts Medical Society, the Roslindale Club and was a vestryman in the Episcopal Church of Our Saviour.

BEAULIEU—DR. FRANCIS XAVIER BEAULIEU died at his home in Taunton, June 13, 1930, at the age of 51. He was a graduate of Baltimore Medical College in 1900, settled in Taunton in 1906 and joined the Massachusetts Medical Society. In later years he had devoted himself largely to the practice of dermatology. He is survived by his widow Marguerite V. Beaulieu.

NEWS ITEM

GIFT TO DR. BLACKADER—We record with pleasure the presentation of a silver platter to Dr. A. D. Blackader, former editor of the *Canadian Medical Association Journal*, by the American Paediatric Society. Those who attended the One Hundredth Anniversary of the *Boston Medical and Surgical Journal* will recall Dr. Blackader's presence with us and his felicitations on that occasion.

NOTICES

REMOVAL

Dr. M. Bennett announces the removal of his office from 462 Cambridge Street, Cambridge, to 311 Commonwealth Avenue, Boston.

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces the following open competitive examination:

Senior Medical Officer (Psychiatry)

Applications for senior medical officer (psychiatry) must be on file with the Civil Service Commission at Washington, D. C., not later than August 27, 1930.

The examination is to fill a vacancy in the United States Public Health Service for duty at the United States Penitentiary, Leavenworth, Kansas, and vacancies occurring in positions requiring similar qualifications throughout the United States.

The entrance salaries range from $4,600 to $5,200 a year. Higher salaried positions are filled through promotion.

Full information may be obtained from the United States Civil Service Commission at Washington, D. C., or the Secretary of the United States Civil Service Board of Examiners at the post office or customhouse in any city.

NOTICES OF MEETINGS

GREATER BOSTON MEDICAL SOCIETY

TAKE ADVANTAGE OF THIS HOT TIP!

The Directors of the G. B. M. S. have decided to offer you a chance to participate in an afternoon's good time.

The preferred stock is being distributed to Members at $3.50 per.

Our Holdings Are:—

Baseball, Tennis, Swimming, Running,
Eating—Entertainment
and
All that goes with having
A good time.

It is the Annual Outing of the
Greater Boston Medical Society
To be held on Wednesday, August 13, 1930
At Riverside Recreation Park
(Beyond Norumbega)
Support the Market at $3.50 by sending your check
WALTER S. LEVENSON,
68 Bay State Road, Boston.

CLINICAL CONGRESS OF THE CONNECTICUT STATE MEDICAL SOCIETY

NEW HAVEN, SEPTEMBER 16, 17, 18, 1930

Advance Program

The Sixth Clinical Congress of the Connecticut State Medical Society will be held in New Haven on September 16, 17, 18, 1930. The morning sessions of the Congress will be held in Sprague Memorial Hall on College Street at the corner of Wall Street. The afternoon meetings of the Congress will be held at the New Haven Hospital, Grace Hospital and the Hospital of St. Raphael. During the Congress the house of the New Haven Medical Association, 364 Whitney Avenue, will be open for the entertainment of members of the Congress, and each evening there will be an informal dinner followed by a non-professional speaker.

HOTEL ACCOMMODATIONS

Accommodations for over night may be arranged at the Hotel Taft or other hotels in New Haven. Reservations should be made directly with the hotel.

GARAGE AND PARKING

Day and night storage for the cars of members will be provided at a garage conveniently located near Sprague Hall.

FEE

The fee for the Congress is $5.00. This includes admission to all sessions of the Congress and garage accommodations.

REGISTRATION

If you expect to attend the Congress, it will be appreciated if you will register now.

Address all inquiries regarding registration to Dr. Creighton Barker, 129 Whitney Avenue, New Haven, Conn.

September 16

10:00 A. M. Undulant Fever. Harold L. Amoss, Durham, N. C.

10:45 A. M. Infections of the Hand. Walter D. Wise, Baltimore.

11:30 A. M. Diabetic Surgery. Leland S. McKittrick, Boston.

12:15 A. M. Common Digestive Disorders. William H. Glafky, New York.

September 17

10:00 A. M. Phlebitis and Thrombosis. Frederick Bancroft, New York.

10:45 A. M. Treatment of Secondary Anaemia. John S. Lawrence, Rochester, N. Y.

11:30 A. M. Therapeutic Value of Digitalis in Pneumonia. John Wyckoff, New York.

12:15 A. M. Eczema in Children. A. Benson Cannon, New York.

September 18

10:00 A. M. Shoulder Injuries. Ernest A. Codman, Boston.

10:45 A. M. Blood Pressure. David Riesman, Philadelphia.

11:30 A. M. Indications for Surgery in Pulmonary Tuberculosis. Edward A. Archibald, Montreal.

AFTERNOON SESSIONS

During each of the three afternoons of the Congress there will be clinical demonstrations, round table conferences and classes of instruction for small groups. These meetings will be held in the wards and laboratories of the hospitals.

SOCIETY MEETINGS, CONGRESSES AND CONFERENCES

March-October — International Medical Postgraduate Courses in Berlin. Complete notice appears on page 853, issue of October 24, 1929.

August 13—Greater Boston Medical Society. Complete notice appears elsewhere on this page.

September 8-12—Postgraduate week of Physical Therapy. Detailed notice appears on page 1025, issue of May 22.

September 14-18 — Fifth International Congress on Physiotherapy. Complete notice appears on page 906, issue of October 31, 1929.

September 16-17-18—Clinical Congress of the Connecticut State Medical Society. Complete notice appears elsewhere on this page.

September 26-27—New England Surgical Society. Detailed notice appears on page 1028, issue of May 22.

October 13-17—Clinical Congress of the American College of Surgeons. Complete notice appears on page 1175, issue of June 12.

October 27—The American Public Health Association. Detailed notice appears on page 1271, issue of December 19, 1929.

March 23-27, 1931 — Fifteenth annual clinical session of the American College of Physicians. Detailed notice appears on page 790, issue of April 17.

BOOK REVIEW

Manuel Élémentaire De Psychiatrie. By M. NATHAN. Masson et Cie, Paris, 1930. Price, 30 francs.

This small book covers the usual lines of a brief résumé of psychiatry. It is well written and, for those who read French, it furnishes an excellent introduction to the subject; for more advanced students, such a book is always a good means of quick review.